THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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A Plating Equipment Company 140 Years Old

A History of the Development of W. Canning & Company, Ltd., Birmingham, England, Which Was Founded in 1785

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WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Electro-metallurgy must necessarily be considered a modern science, because its place in industry is comparatively recent. In view of the importance of recent developments and discoveries, it is particularly interesting to note that a Company dating back to 1785 should still be carrying on business at the same address and be considered one of the most enterprising and progresive in this field in the year 1928.

The Company referred to is W. Canning & Company, Ltd., of Great Hampton Street, Birmingham, England, whose products in equipment and materials represent the latest ideas in all processes governing electro-deposition for either the decorative arts or the more prosaic needs of the engineering world in its interminable battle against the world's greatest enemy—corrosion.

THE ORIGINAL W. CANNING

The history of this firm is of peculiar interest because, although nearly 150 years old, its development can be traced as commencing with the commercial application of electro-metallurgy, and is, therefore, of comparatively recent date. The unique situation of their premises in the very heart of the Birmingham jewelry, silver, electroplate and brass trade is undoubtedly the underlying reason of this firm's original connection with electro-plating business.

Illustrations show the premises as they appeared in 1887. Between that date and the year 1913 they were altered and extended until finally demolished to make way for the modern building which is now the House of Canning. The original building was once a farm-house on a main coaching thoroughfare leading northward out of the town. Opposite the present building is Great Hampton Row which was originally known as Hangman's Lane, from the fact that 5 men were hanged there on the gibbet and remained in chains until the crows had done their work. Originally the business on this location had been that of general druggists and drysalters conducted by W. Gunn, who specialized in those days on heavy chemicals such as were then used in the local industries.

William Canning, the founder of the present Company, was an apprentice to Mr. Gunn who married his master's daughter and was taken into partnership, the title of the business changing to Gunn & Canning and eventually came into the hands of Mr. Canning alone.

In the year 1880, Thomas R. Canning, a grand-nephew of W. Canning, was admitted as an apprentice, and five years later was taken into partnership.

This event really indicates the commencement of the development of the modern business as now established, because its foundations were laid by this energetic apprentice and partner, who worked continuously for forty years until his retirement in 1918.

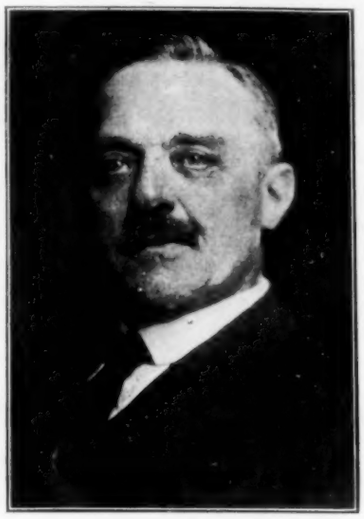
He had already taken into partnership his brother Ernest R. Canning in 1902, and it was due to the loyal co-operation of these two brothers that much of the rapid growth of the firm is due.

T. R. Canning today is still an active Director, and recent developments have been enormously assisted by the fact that both brothers were qualified for their work by sound chemical training. It is certain that progress has not only been accelerated by this fact, but that the great possibilities of future developments through adapting exact chemical science to the needs of practical electro-metallurgy have been thoroughly realized.

When T. R. Canning joined the firm in the early eighties there were only half a dozen employes, and when E. R. Canning, the present managing director,

joined him there were only 19, whereas at present they employ about 700 people.

At the present moment the firm is busily occupied in moving into some entirely new engineering works, specially designed for the needs of the business and equipped with the latest tools for the production of dynamos, motor-generators, resistances, motor-polishing lathes, polishing lathes and wooden and iron tanks.



THOMAS R. CANNING, PRESENT HEAD OF THE FIRM

The chemical side has been developed at a separate works at Bagot Street. These works were started in the year 1900 in conjunction with W. Round, a manufacturing chemist, and eventually passed under the sole control of W. Canning & Company. They have since been rebuilt and are used for the manufacture of aquafortis, metallic cyanides, metal cleaners, and other chemicals used in electro-plating and marketed under the well-known Canning "Zonax" brand.

In 1910 it was decided to manufacture lacquer, and

PRESENT HEAD PREMISES, GREAT HAMPTON STREET, BIRMINGHAM, ENGLAND

several valuable trade-marks have since been firmly established, in home and foreign markets.

Since that time a separate plant has been built in Northwood Street, specially designed to deal with the inflammable character of this trade, and the factory is considered to be of a model design.

LACQUER WORKS

In 1910 the manufacture of brushes was commenced, and this department has developed to great dimensions. Many brushes of special design for the various needs of the metal trade have been made a great specialty.

In 1911 the whole of the premises in Great Hampton Street, the headquarters of the business, were re-built, and today are of quite an imposing character. Here is

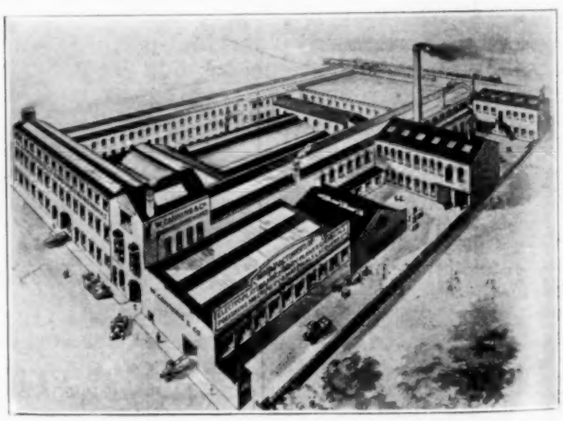
CANNING PREMISES PREVIOUS TO 1887

carried on the manufacture of polishing buffs, of felt and composition, brushes, anodes, etc. A large experimental research chemical and electro-chemical laboratory which was further enlarged and completed in 1927 and the offices and distribution departments are contained in this building; the retail warehouse founded 150 years ago is still retained in this pile.

In 1907, it was decided to establish a centre in London, and this is an important structure, containing everything necessary in the way of large stocks for serving London and the south of England.

In 1921, the home organization was completed by opening a warehouse in Sheffield.

In recent years the enginering side of the business has grown considerably, largely because of the demands of the motor, cycle, electrical and metal trades, for machinery to produce a decorative finish on metal goods. The fullest use has been made of the latest ideas in electro-



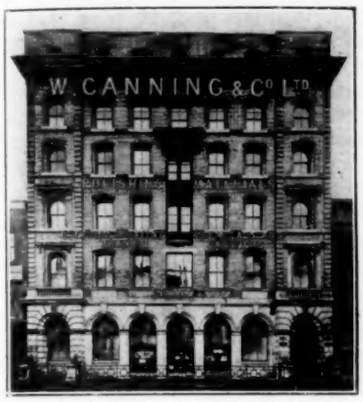
SALOP STREET ENGINEERING WORKS, WHICH IS NOW BEING REBUILT

plating practice—indeed, the great success of the firm has been built by utilizing the science of electro-metallurgy to the fullest extent.

Since the War, the methods of nickel-plating have been considerably modified. Nickel can now be deposited

at three times the speed of a few years ago, and ten times as fast as 20 years ago. A wide variety of apparatus has been devised for speeding up electro-plating. Heating methods have been improved, both as regards steam, electric, gas or kerosene.

Attention has also been given to filtration and special cathode moving equipment apparatus, and other improvements covering every detail of production too numerous to mention. The use of warm nickel is becoming general, since it has been realized how greatly it has shortened the time required for deposition.



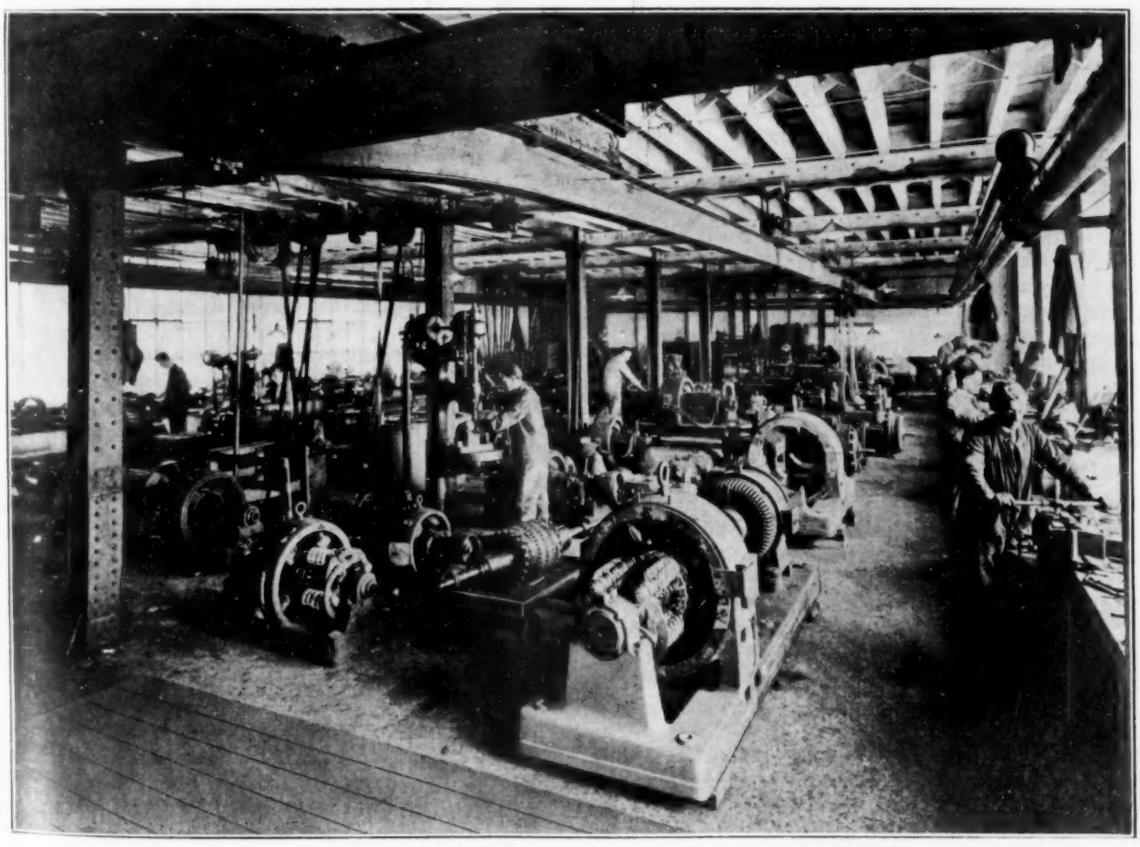
LEFT—LONDON WAREHOUSE

RIGHT—ERNEST R. CANNING, MANAGING DIRECTOR

In connection with rust prevention, cadmium plating is another development in which the company has made progress. This is considered by many people a very effective and applicable method of protecting iron and steel from rust. Cadmium is also preferable to zinc as a protection against alkalis and caustic liquors, and has a great future now that the difficulties of deposition are overcome. Cadmium is being very extensively used for aeroplane parts, and for electrical work.

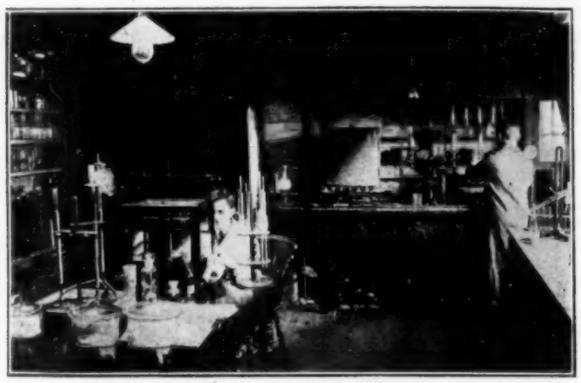
This article would not be complete without some reference to that much discussed metal, chromium. Although used for some time in the manufacture of steel, the electro-deposition of chromium commercially is of comparatively recent date, and after many years of painstaking research work it seems likely that chromium plating will prove to be one of the most important developments which Messrs. Canning have encountered.

We all know its hardness and the busy housewife is already finding its great value as a labor saver which



GENERATOR FITTING SHOP

coincides with a tremendous demand in connection with the manufacture of accessories for motor-cars. Beauty, lustre, untarnishableness, strength, hardness and elasticity



A CORNER OF THE LABORATORY

are all offered by this remarkable metal. It has a great future for motor-cars, charabanc, omnibus and tram fittings, as well as for ship fittings. Its great hardness will ensure its popularity as a metal for electro-typing and various printing operations. The excellent organization of W. Canning & Company, Ltd., is very well qualified to take full advantage of the future possibilities of chromium-plating.

The only other developments we need mention specifically are the production of full automatic plating equipment and automatic polishing and buffing machinery.

In concluding it is interesting to note that the social relations between the management and employees is of the very best, a very strong effort being made to maintain that personal touch so seldom found in limited companies. There is a suggestion scheme in operation which helps to ensure co-operation in ideas for which special grants are made which are satisfactory to both sides. Long Service Awards are given on completion of 20 years' service, and it is noteworthy that a very large percentage of the employes have spent most of their lives in the service of the firm.

A Benevolent Fund is contributed to annually and the administration of the Fund is carried out by a Committee of the Staff and work-people.

Finally there is a bonus scheme of profit-sharing in force by which every member of the staff of at least one year's service partakes of the prosperity of the Company.

Co-operation and service seem to be the keynote of this progressive organization.

Zinc Alloy Gas Valves

Q.—What is the effect of illuminating gas on zinc base alloys?

Would a valve made of zinc base alloy hold against a pressure of illuminating gas up to 15 pounds per square inch? Would the surface of the alloy become pitted or corroded by the gas?

A.—There should be no pitting or corrosion of zinc base alloys as a direct result of illuminating gas. Moisture and mineral acids all attack zinc base alloys but few of the organic chemicals have a very active tendency to do so.

A valve to stand fifteen pounds pressure, if made of zinc base alloy, should be made of an alloy that will not deteriorate due to growth and warpage. Such zinc base alloys are those made of very high grade zinc with the addition of only copper and aluminum and a trace or so of magnesium and must be kept free of tin and lead. Zinc base alloys of the "Zamak" type will have plenty of strength for small valves and will keep their shape for a reasonable period.

—Sam Tour.

Expanding Use of Tin in Cable Covers

Receipt of information that the British Admiralty has issued specifications for lead cable cover containing three per cent tin is creating interest among American cable manufacturers.

The Admiralty decision to try a tin alloy follows five years of experiment in which many combinations were discarded as unsuitable. The use of three per cent of tin was finally decided upon as the proper amount to increase the hardness of the lead covering without seriously affecting its flexibility.

Perhaps the most important effect upon industrial conditions which would result from a general adoption of this practice in this country would be an increase in tin consumption amounting to at least 5,000 tons yearly on the basis of the latest figures available. According to statistics, 180,000 tons of lead cable covering were produced in 1926; an increase of 117 per cent in six years. If that rate of increase is maintained, general adoption of tin alloy for cables would increase the American consumption of tin by 10,000 tons in 1932. This figure represents nearly 15 per cent of the present total consumption.

Mixing Arsenic with Tin

Q.—We wish to combine the following metals: 96.86 per cent tin, 1.95 per cent antimony, 0.26 per cent arsenic. Can you tell us what kind of arsenic to use and the method of mixing so that the arsenic will mix in thoroughly with the other metals?

A.—We have known of some cases where it has been desired to add arsenic to lead base alloys (although we believe this is in some respects without beneficial effect) and the alloys have been produced with the use of metallic arsenic. This can be purchased as such and the names of American producers are given in the Chemical Engineering Catalog. However, we know that in one instance where it was required in ton lots imported material was utilized.

The arsenic should be added to the molten alloy in some way so as to avoid volatilization, such as by plunging it under the surface of the molten alloy in some kind of a container or cage. It can be carried out in a manner similar to the introduction of phosphorus in tin to produce phosphor tin, or as magnesium is added to some aluminum alloys as a deoxidizer. Of course, care should be taken to protect the workman from the fumes; also, the composition should be checked by analysis, rather than depending entirely upon the proportion of arsenic added by weight.

Arsenic and tin form high-melting-point compounds, given as Sn_3As_2 and SnAs. These tend to be eliminated by liquation, although with only about ¼ of 1 per cent of arsenic there would probably be little, if any, trouble in this respect.

—W. A. Cowan.

National Metal Week in Philadelphia

Institute of Metals Division Holds Its Fall Meeting Together with Steel Treaters and Welding Society, October 9-11, 1928

The Institute of Metals Division held its annual fall meeting in Philadelphia, October 9–11, 1928, with headquarters at the Benjamin Franklin Hotel. Simultaneously, conventions were held by the American Society for Steel Treating and the American Welding Society. This is the second year that these three societies have held their fall meetings together under the group name "National Metal Week."

An exposition of equipment and supplies was held at the Commercial Museum, which included all manner of tools and devices for melting, treating and working of metals. Although a large part of this exposition related to iron and steel, there was much of interest to the metal man.

Technical Sessions

The technical sessions of the Institute covered a wide range of non-ferrous metals. Abstracts of the papers read are given below.

At the dinner of the Institute, held on Wednesday evening, October 10th, Dr. F. M. Becket, vice-president of the Union Carbide Company, spoke on Chromium Alloys. Dr. Becket has conducted researches into these alloys for many years, and is one of the pioneers and leaders in the field.

LESS COMMON ELEMENTS IN THE ELECTRICAL INDUSTRY

By T. S. Fuller

This paper discusses the occurrence and character of various little known metals and minerals finding use in the electrical industry. Among those mentioned were sodium, potassium, lithium, calcium, silicon, helium, neon, argon, boron, thallium, rubidium, cerium, lanthanum, praseodymium, neodymium, tantalum, zirconium, tungsten, molybdenum, bismuth, thorium and barium.

ABSORBABILITY OF GASES IN CASTING COPPER AND EFFECT OF ADDING CUPROSILICON

By O. W. Ellis

1. The total volume of gas occluded by solid copper is, other things being equal, a function of the conditions under which it is melted. This fact is well recognized, but is frequently overlooked when the question of occluded gases is under discussion. It is fully realized by the writer that the total volume of gas occluded by solid copper is a function also of the rate of cooling of the metal.

2. Oxidized copper, when brought into contact with carbon, absorbs this element up to a certain fairly well defined limit, the carbon distributing itself between the gases carbon diozide and carbon monoxide in proportions which are dependent on the temperature of the metal.

3. Very little carbon (1½ lb. charcoal per 150-lb. charge) suffices to prevent the oxidation of copper in electric furnace melting practice, when precautions are taken to prevent undue access of air to the interior of the furnace.

4. Castings made from copper melted under reducing conditions in the electric furnace contain neither hydrogen nor carbon monoxide; carbon dioxide, nitrogen and water vapor are the principal constituents of the gaseous mixture in castings made from such metal.

5. Conditions in the oil-fired furnace may be made so reducing as to remove practically all traces of cuprous oxide from oxidized copper charged and melted therein. It is worthy of note, however, that zinc oxide in brass is not reduced under like conditions.

6. Nitrogen is practically absent in copper melted in the oil-fired furnace; carbon dioxide, carbon monoxide and water vapor are the principal constituents of the gaseous mixture in castings made from such metal.

7. Silicon-copper acts first as a deoxidizer in accordance with the equation: $2Cu_2O + Si = SiO_2 + 4Cu$. When its action in this regard is complete, it may act as an agent for increasing the ability of copper to hold gases in solid solution. It cannot, however, act in this way until its affinity for oxygen has been completely satisfied.

8. The absolute necessity of ascertaining the condition of copper in respect of its content of suprous oxide before determining the solubility of any gas in the copper is made quite evident.

DIFFUSION OF ZINC INTO COPPER

By Samuel L. Hoyt

This paper gives a brief description of an investigation made several years ago on the diffusion of zinc into copper. The material for that study was furnished in the form of thin copper strips coated with zinc. Information was desired as to the rate at which zinc would diffuse from the zic coating into the copper and the temperature at which the operation should be carried out.

Experiments were made with 1-sq. in. sheet, 5 to 6 mils thick, set between iron blocks in a nichrome furnace and heated. Data were obtained by which the time-temperature requirements for converting copper strips into brass, either in whole or in part, can be readily estimated.

Penetration is given at 550° C. and 650° C. The time required to convert the whole strip into brass, or for the zinc to diffuse to the center of the strip is 4½ hr. at 550° C., or 30 min. at 650° C.

THE CONSTITUTION OF THE COPPER-SILICON SYSTEM

By Cyril Stanley Smith

After reviewing previous studies by Rudolfi, Sanfourche, Corson and Matuyama, the author presents a new equilibrium diagram, with discussion of the various phases and the methods of work.

TREATMENT AND STRUCTURE OF MAGNESIUM ALLOYS

By John A. Gann

1. The preparation and metallography of magnesium-alloy specimens have been described, and an explanation offered for the structures developed.

2. Solution and precipitation heat treatment produce structural changes in most magnesium alloys which are not necessarily accompanied by property changes.

3. Property improvement due to heat treatment occurs in the magnesium-aluminum, magnesium-zinc, and to a limited extent in the magnesium-tin alloys, where hardness increases of 45, 55, and 8 per cent respectively were observed after precipitation heat treatment.

4. The most pronounced property change in the other alloys occurred in the magnesium-copper and magnesium-nickel series where solution heat treatment caused a softening due to a globularization of the network eutectic.

5. No definite conclusions have been drawn relative to the limits of solid solution. This more detailed work will form the basis of future investigations.

SMOOTHING AND ETCHING CUPRONICKEL, BRONZE, AND STEEL

By H. B. Pulsifer

This paper outlines a method for rapid production of flat, granular surfaces on many of the medium hard alloys. Grinding wheels and fabrics on wheels are not used; the purpose is accomplished by rubbing on emery papers and on fine abrasives heaped on hand boards. The advantages of chromic acid in the solutions for etching nickel and copper alloys are explained. Steels may require an additional step in the mechanical smoothing owing to the lack of an ideal etchant. Chloric acid is a rapid etchant for steel. Thirty-six photomicrographs illustrate the steps in smoothing and the clearness with which structures can be rapidly exposed. New structures in low-carbon steels are announced. After a little practice, many materials can be finished within two or three minutes.

EFFECT OF COLD ROLLING AND HEAT TREATMENT ON PHYSICAL PROPERTIES OF BRITANNIA METAL

By B. Egeberg and H. B. Smith

1. The Brinell test indicates the true hardness and strength of Britannia metal. The scleroscope gives contrary results and the use of this instrument is therefore not recommended for Britannia metal.

2. Britannia metal becomes softer and weaker the more it is reduced by cold rolling.

3. A cold-rolled section becomes continuously harder and stronger upon heating, increasing as the temperature increases up to the melting point (about 460° F.). The hardness of the original cast material is never regained, however, unless subjected possibly to much longer heating periods than those used in this investigation.

4. The ultimate hardness and strength obtained before and after heating depend on the amount of reduction in the rolls. The more the metal is rolled, the weaker it will be, both before and after heat-treating.

5. From 4 it is apparent that the thinner the ingot, the harder will be the metal, because fewer reductions are taken to roll it down to required sizes.

6. The smaller the reduction, the higher is the annealing temperature required to produce a stiffening of the metal.

7. Spun or pressed articles retain the increased hardness and strength brought about by heat treatment of the blank.

8. By making the ingot the thinnest that can be commercially cast, and by heat-treatment the cold-rolled sheet at the highest possible temperature without risk of melting, two effective means are at hand whereby the hardness and the stiffness of articles made from Britannia metal can be greatly improved.

HIGH-STRENGTH GOLD ALLOYS FOR JEWELRY AND AGE-HARDENING PHENOMENA IN GOLD ALLOYS

By E. M. Wise

The physical properties of colored gold alloys, the properties of the gold-nickel series, of the white-gold series, are discussed and tabulated. The hardness changes on annealing and aging and on cold rolling are studied. The mechanism of age-hardening is taken up and pertinent details as to methods of alloying, melting and annealing given.

STABILITY OF ALUMINUM AND MAGNESIUM CASTING ALLOYS

By A. J. Lyon

The stability and permanence of any structural material used in aircraft is of paramount importance. The spontaneous or age-hardening which takes place in some of the aluminum alloys under ordinary conditions of temperature and atmosphere is accompanied by an increase in tensile strength and proportional limit and a decrease in elongation or ductility. Within the last few years the introduction of a number of strong and ductile casting alloys led to a study by the Material Division, Air Corps of the Army, of the permanence of the physical properties in several of these alloys. It has been found that some alloys with good properties directly after casting or heat treatment are not satisfactory for stressed parts that require a combination of strength and ductility, and it has also led to the conclusion that all alloys that can be hardened by artificial aging (heating in a temperature range below 170° C.) (340° F.) will harden spontaneously if allowed to stand for a sufficient length of time. It follows that, in aircraft work where the factors of safety are limited on account of the necessity of keeping the weight of the structures as low as possible consistent with their safe operation, the properties of the alloys in the stable or final condition should be used as a basis for design rather than the properties obtained on the material directly after casting.

After reviewing the work of previous investigators, the method of test is described, and the results of the tests given. These cover aluminum—copper alloys, Al-Cu Mg alloys, Al-Cu-Ni-Mg alloys, Al-Si alloys, Al-Zn alloys, Mg-Al-Mn alloys, Mg-Zn-Al alloys. Tables of properties are given for each group and some typical parts are illustrated.

The National Metal Exposition

The exposition of equipment and supplies was too varied to describe as a whole. It covered the fields of melting, heat treating, cutting, welding, cleaning and in some cases even the finishing of metals. We give below a summary of the exhibits which were related directly or indirectly to the field of non-ferrous metals.

Abrasive Company, Philadelphia, Pa. Grinding wheels for all purposes.

Ajax Electrothermic Corporation, Trenton, N. J. Ajax-Northrup coreless induction furnaces for melting all types of metals electrically.

American Brass Company, Waterbury, Conn. Tobin bronze and other types of welding rods.

American Gas Furnace Company, Elizabeth, N. J. Metal melting and heat treating furnaces, using gaseous fuel.

American Manganese Bronze Company, Holmesburg, Philadelphia, Pa. Hy-Ten-Sl bronze in castings (sand and centrifugal) rods, bars, sheets and forgings.

American Metallurgical Corporation, Boston, Mass. Tilting pot furnaces; holding pots; white metal melting pots.

Armstrong Cork and Insulation Company, Pittsburgh, Pa. Nonpareil insulating brick.

Bellevue Industrial Furnace Company, Detroit, Mich. Metal melting furnaces for aluminum and brass, using oil or gas fuel.

G. S. Blakeslee and Company, Chicago, Ill. Metal parts washing machinery.

Botfield Refractories Company, Philadelphia, Pa. Adapatch, a plastic patching material.

Brown Instrument Company, Philadelphia, Pa. Automatic temperature control instruments.

Carboloy Company, New York. Carboloy, a new cutting tool alloy of tungsten, carbide and cobalt.

Celite Products Company, New York. Sil-O-Cel for insulation.

Dearborn Chemical Company, Chicago, Ill., and New York. Cleaners for metal and other products.

Duriron Company, Dayton, Ohio. Duriron parts and equipment for corrosion resistance.

J. B. Ford Company, Wyandotte, Mich. Cleaners for metal surfaces before finishing.

Gehnrich Indirect Heat Oven Company, Long Island City, N. Y. Japanning and lacquering ovens.

General Electric Company, Schnectady, N. Y. Welding equipment; heat treating furnaces; electrical brazing, enameling and annealing equipment.

Hisey-Wolf Machine Company, Cincinnati, Ohio. Electrc drills, grinders and buffers.

Holcroft and Company, Detroit, Mich. Metal melting and heat treating furnaces.

Ideal Industrial Machine Company, Cincinnati, Ohio. Equipment for metal cleaning, washing, drying, separating and burnishing.

International Nickel Company, New York. Nickel for various purposes, such as additions to alloys, etc.

Charles F. Kenworthy, Waterbury, Conn. Annealing and heat treating furnaces.

Lava Crucible Company, Pittsburgh, Pa. Super-Refractory non-ferrous furnace shapes.

Leeds and Northrup, Philadelphia, Pa. Furnace control instruments.

Metal and Thermit Corporation, New York. Thermit carbon-free metals.

Milwaukee Die Casting Company, Milwaukee, Wis. Die castings.

Mueller Brass Company, Port Huron, Mich. Forgings, castings, rod, seamless tubing and fabricated parts in brass, bronze, copper, nickel, silver, aluminum, etc; also nickel plating.

Norton Company, Worcester, Mass. Grinding wheels and refractory cements.

Nukem Products Corporation, Buffalo, N. Y. Suspended frame type pickling machines.

Pyrometer Instrument Company, New York City. Pyro-Insertion pyrometer for molten metals.

W. S. Rockwell Company, New York. Industrial furnaces of all kinds.

Shenango-Penn Mold Company, Dover, Ohio. Centrifugally cast bronze.

Shore Instrument and Manufacturing Company, Jamaica, N. Y. Direct reading scleroscope.

Surface Combustion Company, Toledo, Ohio. Gas burning furnaces for all industrial purposes.

Thwing Instrument Company, Philadelphia, Pa. The Super-Pyrometer recorder.

Harold E. Trent Company, Philadelphia, Pa. Electric furnaces for metal melting.

Wilson-Maeulen Company, New York. Rockwell hardness testers.

The Use of Metals in Dirigible Construction

The successful voyage of the Graf Zeppelin, huge German dirigible, which crossed the Atlantic in 111½ hours, has given rise to a great deal of interest in this type of aircraft, and to the metal industry this is of particular interest since the dirigibles have structural frameworks entirely of metal. It required 30 metric tons of Duralumin to build the Graf Zeppelin. That no small amount of metal goes into such construction may be seen from the fact that the commander of the Graf Zeppelin recently declared that there would need to be four of these monster ships before a real service could be inaugurated, while the United States Navy in October authorized contracts for two dirigibles which will be the largest in the world. Upon completion of his trip from America to Germany, Captain Eckener declared that the dirigibles of the future would have to be much stronger, to withstand the terrific strains put upon them by wind and storm during passage over the Atlantic. This would imply that the use of the light alloys will constantly increase in this field.

The metals to be used in these two ships have been described for THE METAL INDUSTRY by the Goodyear-Zeppelin Corporation as follows:

"Aluminum alloy known as Duralumin will be the material mainly used for the hull structure and its structural attachments such as fins, rudders and pilot car. The structural members, or girders, are made up of sheet material consisting of strips and channels which are provided with flanged lightning poles and which are riveted together by Duralumin rivets.

"Bar Duralumin will be used to some extent for screws, bolts, pins, nuts, barrels for turnbuckles, bushings, pulleys and for other small parts, if suitable. Duralumin forgings are limited to small parts such as levers, hooks and the like. Duralumin tubing will be used for struts.

"Aluminum sheets will chiefly be used for gasoline, oil and water tanks, for condensers of the ballast water recovery, and also for the equipment of the kitchen and toilet. Aluminum tubing will be used for the water system. Aluminum castings will be used for power transmission casings, bearings, armatures and fittings for the various tanks, brackets and supports. Aluminum powder will be used as a protection for the outer fabric cover.

"A magnesium alloy which is lighter than Duralumin, may, where practical, be used instead of aluminum for such things as covers, sheaves and parts of minor importance. Brass sheets will be used for radiators, and brass bars for pipe unions and small fittings. Brass tubing will be used for gasoline pipe lines, and brass wire for binding loops of wire bracings. Copper sheets may be used in very small quantities for various purposes. Copper tubing will be used for gasoline and oil lines. Bronze castings will be used for worm wheels of the power transmission and for bushings. Tin will be used for soldering, and cadmium for casting steel parts against corrosion."

Metals Going to Antarctic

Since the previous issue, in which we published an item under the above caption, we have learned that the propellers on the airplanes to be used by the Byrd Antarctic Expedition were made with steel hubs but blades of forged aluminum. They were fabricated, as we stated, by the Standard Steel Propeller Company. The Aluminum Company of America furnished the rough forgings for the propeller and for other parts of the planes.—ED.

Rubber Binders for Foundry Cores

Bureau of Standards Discovers a New Class of Core Binders. Abstract of Letter Circular No. 252, Bureau of Standards—Part 1

INTRODUCTION

The removal of cores from castings is an expensive, laborious and dusty task, often requiring the use of a pneumatic chisel or other tools. Cracked castings, due to hard cores which do not crush as the metal solidifies, are also a source of loss especially in aluminum foundries. Core blows, due to low permeability of the core, are still another source of loss. Green sand cores are used to avoid these troubles where it is feasible to do so, but the weakness of green sand cores prevents their use in many cases where the foundryman would use them if he could.

The Bureau of Standards has discovered a class of core binders whose outstanding advantages are:

1. The cores crush readily, falling to loose sand of their own accord so that the core sand may be *poured* from the casting instead of having to be dug out.
2. The cores have greater strength than a green sand core and extend the range of jobs to which a readily crushed core may be applied.
3. The cores are not oven-baked, they are merely air-dried.
4. The cores are of high permeability and remarkable freedom from blowing.

Since no other core binders have such a set of properties it is natural that the choice of the sand and the core-making practice will vary from that for other core binders and that best results should not be expected if the new binders are substituted for others without first making sure that the core sand is of the proper type to give the benefits of the new binders. At present this has to be done by experimenting.

The new binders consist of rubber, of balata (a material similar to rubber in many of its properties), or of a special commercial type of rubber cement, each dissolved in a suitable solvent such as gasoline for plain rubber and benzol for balata and the special cement.

FIRE HAZARDS

Since these solvents are flammable it is obvious that their use constitutes a fire hazard, and equally obvious that the preventive methods used in other manufacturing processes using such solvents can and should be applied. Anyone who is not willing to enforce such measures should not attempt to secure the benefits of the new binders.

It is probable that by suitable choice of solvents the fire hazard can be greatly reduced, but research along those lines need not be undertaken until more information is available on the applicability and utility of the binders.

SAND

Inasmuch as the chief reason for using the new binders is to make the knocking-out of cores easy, it would be foolish to use a sand which, irrespective of the binder used, will bake hard by the heat of the casting and require digging-out anyway. Hence the core sands for these binders should be **free from,** or **very low in, clay content.**

Since most of the binders are aimed to extend the range of green-sand core work rather than to replace hard dry sand cores, it is advisable to select a sand that will lend itself to the production of a sufficiently strong core, rather than to handicap the binder by using an unsuitable sand and thus to require more binder. As a matter of fact, rubber is rubber whether it is in a rubber sole or a core, and the use of too much rubber will give a core that is too flexible without greatly increasing its strength. The purpose of the rubber is to hold the sand grains in contact with each other and maintain their bearing on each other. It does not, in itself, dry to a strong, stiff substance, but to a flexible one.

MOISTURE CONTENT OF SAND

Since the rubber binders are not baked in an oven but are merely air-dried, the sand used should be **dry.** If not practically free from moisture the sand should be dried before using. The rubber bond will not adhere well to damp sand and moisture in the core might tend toward blowing especially on a sand of low permeability. However, free-flowing air-dried sand is ordinarily suitable without drying by the application of heat.

THE PLAIN RUBBER BINDER. CHOICE OF RUBBER

In order to distribute the rubber over the sand grains it must be dissolved in a solvent. (There are possibilities in the use of latex, i. e., "rubber milk," but so far this has not been found as satisfactory as dissolved rubber.)

Vulcanized rubber is not soluble so the plain rubber binder is not an outlet for old automobile tires or tubes. The rubber must be **raw, unvulcanized rubber.** Crude rubber as received is not satisfactorily soluble until it has been "milled" or "masticated," i. e., kneaded and worked between rolls or in other suitable apparatus. The trade designation for a suitable rubber is **milled smoked sheet.** It may be obtained from rubber goods manufacturers in the milled condition. Rubber is somewhat variable and the behavior of different lots may vary somewhat. The rubber should go into solution in gasoline as described below, forming a cement much like that used for tire repairs. Commercial rubber cement may or may not be suitable. Makers of rubber cement who understand the use to which the material is to be put should have little difficulty in preparing a suitable binder.

PREPARATION OF THE RUBBER-GASOLINE SOLUTION

The gasoline used should be of a quality, so that only traces of a kerosene-like non-volatile residue are present. The type of gasoline commercially known as "aviation gasoline" is satisfactory.

The rubber is cut into small pieces so as to present a large surface to the solvent. A good ratio of rubber to solvent is one pound of rubber to two gallons of gasoline, i. e., approximately 7% by weight. Any suitable method of mixing can be used. Experimentally a simple way is to put about ¼ lb. rubber and about 2 quarts gasoline in a large glass fruit jar, tightly close the jar and mount it on a rotator (such as was formerly used in the A. F. A. fineness test method for washing sand with caustic soda for the separation of clay bond before it was supplanted by the stirrer method). The best results are obtained if the jar is not entirely filled so that the air space allows greater motion of the contents.

The up-ending of the container as it is rotated mixes the rubber and gasoline, and when the solution is complete (mixing overnight will usually give complete solution) the binder is ready for use. The solution must be complete, with no clots of undissolved rubber. It should, of course, be kept in a tightly closed container till it is to be used to prevent rapid evaporation of the solvent.

MIXING THE SAND AND THE BINDER

The binder is mixed with the dry core sand in any suitable type of muller or mixer, or, experimentally, by hand-rubbing. The mixing operation must be carried out with due regard to the flammability of the gasoline. If the gasoline evaporates too fast, the binder can be diluted with more gasoline before using. Sand that is partly dried out can be retempered by adding gasoline, but some time must be allowed for the mass to become of uniform temper.

When the sand and binder are properly mixed, the mixture does not have the "stickiness" of the cement, but will rub off the hands readily and will not stick to the core boxes. Tempered sand should be kept in closed containers to prevent too rapid loss of gasoline. The core bench should have good ventilation, with proper precautions against any danger of fire or explosion from the gasoline vapor drawn off. If large scale operation is carried on, recovery of gasoline from the ventilating system might be advantageous.

After the core is rammed, just as any other core is rammed, it has a strength rather higher than that of ordinary rammed molding sand, and much higher than that of an oil sand core as it comes from the sand box. Nevertheless the cores need rodding much as a green sand core would. Since the rods or wires come out readily without being distorted in digging out the core, bent wires can be re-used over and over again.

DRYING THE MOLDED CORE

The next operation is drying the core. Small cores up to say 1½ inches diameter, especially if a sand of high permeability is used, will loose gasoline so rapidly that they can be placed in the mold at once, without waiting for drying out, a matter of considerable convenience in a rush order for a cored casting. While a small amount of gasoline doubtless remains, it has given no trouble.

Larger cores should be allowed to dry at room temperature and, if the recovery of the gasoline is desired this should obviously be done in a closed chamber through which a gentle current of air is drawn, and the solvent recovered by usual solvent recovery methods, with proper precautions against fire. On a small scale, or for experimental purposes where it is not desired to recover the gasoline, simple air drying, away from flame or sparks, will serve. Slight warming as with a steam coil will hasten the evaporation of the gasoline.

The rate at which the compressive strength develops in cores 2 inches high by 2 inches diameter (standard permeability specimen) is such that over half the strength is developed in the first half hour and practically the full strength in 2½ to 3 hours.

Hence the cores may be used within a short time, or may be used after drying overnight, or for a longer period. The moisture resistance of the cores, i. e., their ability to be used after long storage, appears to be very good but has not yet been quantitatively studied.

The rubber bonded cores are not to be baked as other cores are baked.

VENTING THE CORES

With any size or shape of these cores yet tried at the Bureau, in castings of any metal, no venting has been required. The permeability is high and the core-prints give sufficient vent.

PLACING THE CORES

It must be remembered that the plain rubber cores are not as strong as **baked** sand cores. They must be rodded and placed much as green sand cores, but are enough stronger so that there is far less danger of breakage than with a green sand core.

CASTING

Casting of the metal differs in no way from the practice when other cores are used. It would be expected that an objectionable odor of burnt rubber would be noted, but with ordinary shop ventilation this is scarcely noticeable.

SHAKING OUT

If a core sand sufficiently low in clay has been chosen so that the heat of the casting has not baked the core due to the clay bond alone, the core will, of its own accord, or on slight tapping, fall into loose sand and will **pour** cleanly from the casting, without any sign of "burning-on" of the sand. The plain rubber bonded core sand from a lead casting, if the sand is not so coarse that the lead grips the outer grains too much, will break up and pour freely, while baked cores will not. The same free-flowing behavior of the core is met in castings of **tin, zinc, brass, bronze, phosphor-bronze, aluminum, cast iron,** and even **steel.** Although the core disintegrates very readily, it nevertheless holds its form till the metal is frozen and gives a casting true to the core. Core sand which is not refractory enough for a steel casting, when used with rubber binder has freed itself from steel without any "burning-on" whatsoever. There is probably a limit to the size of the core and the mass of metal cast around it in which these binders will give a casting true to the core, but as the Bureau's work has so far been confined to relatively small castings it is not yet known just what this limit may be.

A phosphor bronze bushing 3¼ inches outside diameter, ¾ inch inside diameter, 7 inches long cast around a rubber bonded core gave excellent results.

Aluminum copper alloy with 8% copper (No. 12 alloy) cast as a thin-walled box with sharp edges and corners, which would have been liable to crack when cast around most cores, did not crack with the rubber-bonded core.

RE-USE OF CORE SAND

The burnt sand from a rubber-bonded core may be reused. One possible drawback may be the contamination of the molding sand by the core sand, since the core sand falls out of the core so readily that it may be difficult, in some castings, to prevent its mixing with the molding sand.

PLAIN RUBBER PLUS "STIFFENERS" OR "ANTI-SOFTENERS"

Zimmerman and Cooper[1] point out that certain chemicals act as "stiffeners" of uncured rubber. Among those mentioned are benzidine and para-amidophenol. A quarter of a per cent of the former or a half a per cent of the latter on the weight of the rubber is said to stiffen uncured rubber about 40%. Since the rubber in the core is uncured, this offers a means of getting a somewhat stronger core.

Benzidene was dissolved in ether and added to the plain rubber cement in proportion to give ¼% on the basis of the rubber present. Fairly rapid increase in strength is shown up to 3 hours without benzidene and up to 5 hours with it, and the maximum strength is quite materially improved by the "stiffener."

This is the only set of experiments that has been made on "stiffeners" so far, but the matter is obviously worth carrying farther, as it offers a means of increasing the strength of the core or of reducing the amount of binder.

[1] Zimmerman, E. C., and Cooper, L. V., Softeners and anti-softeners, Ind. Eng. Chem. 20, 1928, p. 812.

This article will be concluded in an early issue.—Ed.

The Production of White Bearing Metals and Tin Solders from Scrap Metals

Methods of Purifying and Mixing Scrap to Produce Marketable Alloys—Part 2*

By EDMUND R. THEWS
Consulting Engineer

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

REMOVAL OF ZINC†

Although, theoretically, zinc may be removed from white bearing metal in the melting pot as well as in the reverberatory furnace, the melting pot process will be efficient only if the amount of zinc present does not exceed 0.10 or 0.15%. On account of the comparatively long time required to remove larger percentages, the amount of tin lost would make this process unprofitable.

The process is carried out by passing superheated steam through the metal at a temperature of about 900° F. It has been mentioned in a former article that boiler steam should not be used for this purpose since, apart from the costly and complicated apparatus required, there is always the danger of explosion arising from the condensation of steam in the long and thin connecting pipes.

The steaming device to be used has been described in the article on the production and remelting of zinc scrap above referred to and need not be explained again. Steaming is continued until the surface of a small sample plate does not show the typical zinc skin anymore.

If both zinc and copper are to be removed, the latter should be eliminated first in order to make use of the well known affinity of zinc for copper. In view of the influence of the large amounts of tin and antimony upon the effectiveness of this affinity, the reaction cannot be as perfect as in the case of pure lead where, as is the case in the desilverisation process, the copper—together with the gold—is removed by the first addition of zinc. Nevertheless, the effects of the affinity between copper and zinc will be noticed even here, if the metallic bath is left to cool down almost to the freezing point of lead, that is to say, about 600° F.

This process will prove to be particularly useful for small melting plants working with melting pots only, where bearing metal scrap containing comparatively large amounts of zinc must also be treated in pots. For instance, a white metal bath containing, say, 1.50% of copper and 0.4% zinc, may be almost completely dezincified by permitting the copper to segregate out by cooling the metal.

The removal of zinc is still frequently carried out by passing compressed air through the bath or by treatment with hydrochloric acid. Both of these methods are distinctly disadvantageous. Whilst quantitatively the oxydizing effect of air equals that of steam, it acts strongly oxydizing on tin and antimony also thus giving rise to appreciable losses of these metals. This is particularly true on account of the fact that the best oxydizing effect of the air on the zinc is asserted if the metal is heated to redness, as is done in the reverberatory furnace treatment.

Hydrochloric acid, besides influencing but weakly the zinc or any other impurities of bearing metals, possesses a very corrosive influence upon the iron parts of the melting pot plant, particularly upon the hood, which is quite frequently destroyed within one or two months. If salamonia (ammonium chloride) is used instead of hydrochloric acid, corrosion of the iron parts is avoided while the refining influence is not much improved.

If the removal of copper is carried as far as to include the sulfurizing treatment, this should be followed by at least 5 minutes of steaming in order to remove all traces of metallic impurities and sulphur introduced by that treatment.

The white metal alloy freed from zinc and copper must now be subjected to a segregation treatment in order to separate from the bearing metal alloy the "tin alloy" used for the production of solder.

It should be stated at once, that the production of tin alloy in the melting pot as practised at present can not be carried out nearly as efficiently as in the reverberatory furnace, and that the melting pot should only be used for this purpose if reverberatories are not available. Besides, good results can only be obtained with very large pots, a capacity of 7 tons being about the lower limit. Another serious limitation of the melting pot process is the fact that appreciable amounts of tin alloy will be obtained only if the alloys treated contain at least 48-50 per cent of tin and less than 8-9 per cent antimony.

By the English process of production, as described by L. Parry, the assorted charge of white metal, cast into pigs, is piled up in a pot holding about 15 tons. The pot is gently heated, and the most easily melted alloy liquates, and is dipped out into moulds. According to Parry, "this product is to all intent and purposes tin alloy, containing about 53-54 per cent of tin. The heat is kept very low all the time. After a time metal ceases to drain out, when the temperature is raised, and a metal drains out which holds 43-45 per cent of tin and 4.5 per cent of antimony. After these seconds have all been drained out the heat is again raised and a metal drained out containing about 35 per cent of tin."

The most striking part of this process is, that the first product obtained is not tin alloy, which must contain at least 55 per cent of tin, and that for this reason the antimony contents cannot be as low as 3.5 per cent, a fact which speaks very strongly against its use for all but lower grades of solder.

The reasons for the imperfection of this method are obvious. A proper eliquation of the fusible components of the raw material may, perhaps, be obtained if the pigs were lined up along the walls of the pot where there would be a chance at heating them uniformly and at obtaining a uniform product. This is absolutely impossible, however, if the metal is piled up according to the method described by Parry. It is evident that the blocks reposing directly on the bottom of the pot will be heated to a much higher temperature than the pigs hanging somewhere in midair one yard above the bottom, so that at the time these latter pigs have been brought up to the melting temperature of tin alloy, (182-184°C = 360-

*Part 1 was published in the issue of September, 1928.

†Erratum—In the previous instalment of this article there appeared, on page 396, in the tenth line of the section entitled "Removal of Copper in the Melting Pot," the phrase: "dry mass containing 20 to 30% of copper." This should have read "2 to 3% of copper."—EDITOR.

363°F) the pigs down below must have reached a temperature far beyond that necessary for the production of suitable base alloy for tin solder.

Far better results are obtained by another method based on the same principle. The process is carried out in the so-called eliquation pans, the most perfect type of which is shown in Fig. 2, and which consists of two cast iron plates reposing in an oblique position on a slightly inclined cast iron trough leading into a melting pot. The pigs of metal are laid side by side on these plates, and the fire increased gradually until the pigs begin to "sweat." After all the metal liquated at that temperature has been removed, a second grade metal is produced by raising the temperatures a few degrees, and so on, until the residue left on the plates is distinctly hard, forming a drossy mass which is removed and, after cooling down the plates, replaced by a new lot of raw pigs.

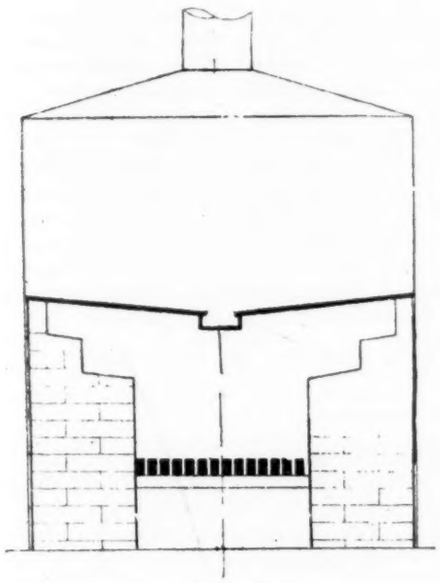


FIG. 2—LIQUATION PAN

There can be no question, of course, that this method is only applicable in small melting works, but it possesses the advantage of giving a high grade product. Indeed, the author has been able to produce tin alloys containing 58-60 per cent of tin and correspondingly low amounts of antimony in an old and half ruined eliquating outfit of this type.

The only efficient melting pot process is based upon the principle of segregation and is carried out as follows:—

The raw material, containing at least 48-50 per cent of tin is charged into the melting pot until this is filled up to about 5 inches from the rim. As soon as all the metal is in a thoroughly fluid condition, firing is stopped and all possible sources of air circulation below the pot eliminated by closing the doors of the fire and ash pit as well as by shutting off the flue.

On cooling gradually, the surface of the metal commences to be covered with a dark drossy material containing most of the copper present in the alloy. After this has reached a thickness of about ½ inch it is taken off by means of perforated ladles and put into long moulds.

On reaching a temperature of 190-198°C (375-390°F) the formation of crystals increases rapidly until at about 187°C (370°F) it becomes quite copious. At this stage of the process, crystals do not only form on top of the metal but along the sides and bottom of the pot as well, although in the case of as soft a metal as this, bottom crystallization is not as pronounced as with the ordinary raw material represented by bearing metal scrap. These crystals must also be removed as far as possible.

It is clear that at this stage of the process careful operation will permit of almost perfect separation of the various grades of alloys recovered, the crystals taken off first being comparatively rich in antimony and poor in tin. Work should be carried out with the aid of a reliable thermometer or pyrometer, and the grades of the alloys separated in accordance with the decreasing temperatures, the crystals solidifying during each period of about 3°C (5°F) being collected into one lot.

On reaching a temperature of 183-184°C (360-362°F) the rate of crystallization rapidly declines, finally ceasing entirely for a short time. This point indicates the commencement of the crystallization of the eutectic, (that is to say, the tin alloy) and the liquid melt remaining must now be ladled out as quickly as possible, since having arrived at this point, crystallization of the eutectic alloy proceeds rather rapidly. All available hands are employed in ladling out the liquid metal, the ladles being prewarmed since in a cold state they would at once be covered heavily with frozen alloy.

It is evident that the only seriously weak point of the melting pot process for the production of tin alloy is the freezing of considerable quantities of tin alloy at the end of the operations, which is entirely due to the impossibility of removing the soft material with sufficient rapidity. There are two ways of avoiding this disadvantage:

1) Holding the melting pot and its contents at a minimum temperature of about 183°C (360°F), which would permit all the hard material to solidify, but prevent the crystallization of the tin alloy solidifying at 360°F.

2) Removing all the tin alloy at "one shot" as soon as it has been isolated.

The first method is best carried out by connecting the pot with a channel leading either from a furnace or set of furnaces and carrying hot waste gases, or into a special firing. As soon as the metal in the pot has cooled down to about 190°C (374°F) this channel is connected with the fire room of the pot, and the gases, which by introducing air through inlet pipes may easily be regulated so as to possess a temperature of 183°C, led around the pot, thus preventing its temperature to fall below the freezing point of tin alloy.

The realization of the second method of operation is not effected as easily and the author is not aware of any practical applications as yet. However, there appears to be one way of removing all the tin alloy from the pot within a few seconds. It seems quite practicable indeed to arrange the melting pot and its mounting so as to permit this to be tilted over onto one side. There need be no hinges or similar complicated details. The rim of the pot may on one side be cast stronger and wider and provided with a straight edge about 25-30 inches long. This edge may be supported in a corresponding heavy ridge cast onto the supporting plate. Now, if this straight part of the rim is provided with a channel serving as spout, and if a few heavy ears are cast into the opposite part of the rim, the pot may easily be lifted up and the tin alloy poured into a neighboring melting pot.

There can be no question that if these practical difficulties connected with the production of tin alloy in the melting pot are eliminated, this process will be equal to, if not superior to the reverberatory furnace methods.

This article will be continued in an early issue.—Ed.

Manufacturing Metal Parts by Electrodeposition

By JAMES SILBERSTEIN

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Industrial competition and steady efforts to cut costs of manufacturing materials have brought forth several radical changes in the art of making metal products. Casting have to a great extent being replaced by forgings and stampings, which are not only cheaper where quantity production is involved, but also considerably stronger.

Another step to cut costs in the manufacture of metal articles of relatively thin gage will be the production of these by electro-deposition. This process is theoretically identical with electroplating, but differs from the latter process in its requirement of time. The electroplating or electrodeposition, of a very thin metal film is carried out in a very short time. To build up a piece of metal by electrodeposition, however, takes a very long time as compared with plating, and this has retarded its application on a large scale while the plating industry has grown considerably in recent years.

It has been known that the time for building up metals electrolytically can be shortened by increasing current density, but this results in a deposit of poor appearance and considerably impaired mechanical properties. In recent years, however, this trouble has been eliminated by introducing mechanical devices and rapid stirring of the electrolyte, and there is no doubt that further improvements will shorten the time necessary for electrodeposition to a still greater extent.

The manufacture of seamless copper tubes by electrodeposition has been described by the writer in a previous article in THE METAL INDUSTRY.* Another application of electrodeposition is the making of sheet copper for punchings and stampings. Ordinarily rolled copper sheet has to be bought at a price considerably above that of cast copper. The scrap produced in trimming and punching must often be disposed of at a price somewhat under that of the cast copper. This scrap loss often amounts to 30 per cent of the metal used. By using cast copper as anode and electrodepositing it on a roll to form an endless strip, all scrap resulting from punching and trimming will go back as anode metal, thus reducing actual scrap losses practically to zero. Copper gaskets are made by one concern in this way. Complicated shapes can also be made by electrodeposition. So, for instance, light reflectors and copper float shells for steam traps and water columns are made this way instead of being manufactured by stamping and spinning. With regard to the latter, the electrodeposited float shells have been found superior to those made by stamping two hemispherical shapes and assembling by soldering. The latter are subject to electrochemical corrosion, since they consist of metals which form a galvanic element in contact with an electrolyte, while the former, being uniform are not affected.

It is to be expected that with further progress in the art and knowledge of electrodeposition, the application of this process to the manufacture of metal parts will greatly increase.

* Manufacturing Seamless Copper Tubing Electrolytically; Dec. 1927, page 487.

Lubricant for Valve Packing

Q.—We want to know the methods used for lubricating cone and square packings composed of rubber and inserted cotton. These packings are used in bibbs, faucets, compression stops, and bath and basin faucets. We have used flake graphite as a lubricant, but it is not satisfactory as it does not penetrate the packings. Have also used packings made from asbestos and find them too hard for cold and hot water, but they are suitable for steam. Our competitors are using a liquid lubricant on their packings and we are desirous of knowing how this is applied.

A.—You should use packing composed of the highest amount of cotton and a low percentage of rubber. Use common beef tallow as a lubricant in a hot liquid form. Melt tallow on a gas or electric stove plate to the most suitable temperature in a two-gallon porcelain can or bucket. Place packings in a perforated or wire bucket and immerse same in the hot liquid tallow for three minutes; remove perforated bucket containing packings and allow to drain over the hot tallow. This method allows the lubricant to penetrate inside the packing.

—P. W. BLAIR.

Die Casting Duralumin

Q.—Can Duralumin (17S alloy) be die cast? Do you know of any commercial work being done along such lines?

A.—17S alloy is nominally an alloy of 4% copper, 0.5% manganese, 0.5% magnesium, balance aluminum. Such an alloy can be die cast but it will not have any of the characteristic properties of Duralumin when so cast. The special properties of Duralumin alloys are developed as a result of heat treatment on mechanically worked material. The mechanical working is absent in a die casting. The heat treating temperatures necessary are such as to cause blistering of die castings, due to their inherent porosity.

—SAM TOUR.

Aluminum to Resist Soap Solution

Q.—Please give us the formula for an aluminum alloy which will resist the corrosion caused by soap solution.

A.—We have found that an alloy consisting of 95 per cent aluminum and 5 per cent silicon answers this purpose very well. Such an alloy will also resist ammonia, sea-water, etc.

—J. M. HUTTON.

Hard Solder

Q.—What is a good composition for a hard solder which will flow very freely? Presumably this should be mostly spelter with much smaller percentages of copper. Can you recommend anything? Can you give us the names of any manufacturers who make such a solder?

A.—The alloys or spelters used for brazing are composed of copper and zinc. The melting points of these alloys depend upon the percentages of zinc. An easily fusible alloy is composed of two parts zinc and one part copper, but the joint will be weaker than when an alloy more difficult to fuse is employed. Consult advertising columns of THE METAL INDUSTRY for manufacturers of solders.

—P. W. BLAIR.

Cadmium Plating in Quantity Production

A Discussion of an Article Published in The Metal Industry for June, 1928

To the Editor of THE METAL INDUSTRY:

The writer has found the article "Cadmium Plating in Quantity Production" by Mr. C. H. Loven published in the June, 1928, number of THE METAL INDUSTRY, Vol. 26, No. 6, to be exceptionally interesting. There are some parts of this article, however, to which the writer takes exception and other parts on which further explanation should be given in order that the conclusions may not be misleading.

Referring first to the determination of total cyanide and the determination of total alkali, the writer finds that these methods are substantially those given in "Principles of Electro-plating and Electro-forming" by Blum and Hogaboom for determination of the total cyanide in zinc solution and the total alkali in zinc plating solution. This method for determination of total cyanide, while quite satisfactory for zinc cyanide solution, determines only the free cyanide in case of the cadmium sodium cyanide solution, due to the fact that in the case of the zinc cyanide solution an excess of caustic forms a soluble sodium zincate, whereas the addition of caustic soda to the cadmium cyanide solution does not form a soluble sodium cadmium salt, due to the fact that cadmium is not amphoteric in character. The method described, therefore, determines only the free cyanide in the cadmium cyanide solution and not the total cyanide as indicated. The determination of total alkali is not only unsatisfactory, due to the fact that the end point is very indefinite, but is inaccurate as it only determines a portion of the total alkali. However, this method may be used for control work if a check solution is used and the results are compared from time to time, as this method will show any increase in the alkali content.

The method of determination of cadmium as metallic cadmium in the solution is fairly satisfactory when no zinc is present in the solution. However, if zinc is present this method will determine both cadmium and zinc. When the cadmium cyanide solution contains no metal but cadmium, this method is as satisfactory as any method where an outside indicator is used.

The writer, furthermore, disagrees with the author's statement that all addition agents (adulterants, as he terms them) reduce the corrosion resistance materially. While it is possible that some of the addition agents may reduce the corrosion resistance it has been the writer's experience that the few addition agents which work satisfactorily with cadmium plating solution do not decrease the corrosion resistance. The author of this paper undoubtedly has found a decrease in corrosion resistance in his experiment and this can probably be explained by the following: Employing a sodium cadmium cyanide bath with a relatively low cadmium and sodium cyanide content such as the author used and maintaining a constant condition with respect to the voltage the introduction of most of these addition agents produces an increase in the polarization potential on the cathode and to some extent on the anode which of course increases the resistance of the

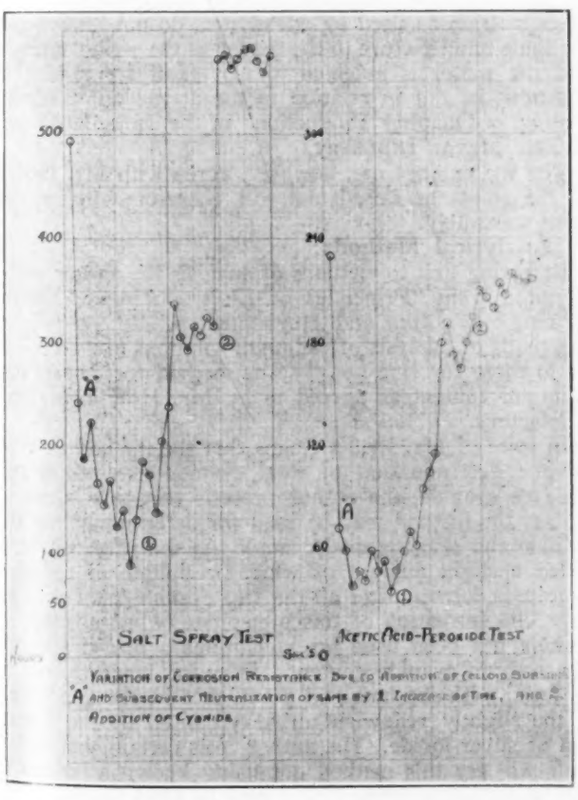


Fig. 1—Effect of Variables on Corrosion Resistance

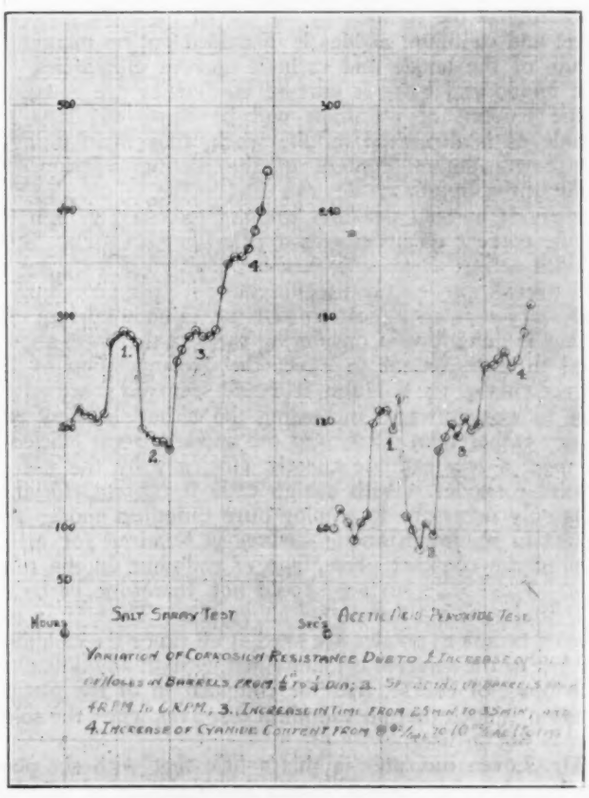


Fig. 2—Effect of Variables on Corrosion Resistance

THESE TWO PLATES APPEARED WITH THE ARTICLE UNDER DISCUSSION

bath and decreases the current. The amount of cadmium deposited, therefore, within a given time will be less and the corrosion resistance lower. The corrosion resistance, however, per unit of thickness of cadmium on the iron and steel remains with most of these addition agents substantially the same, and in some cases is very appreciably increased, due to the character of the metal deposited. With sodium cadmium cyanide solutions with higher concentration of cadmium and sodium cyanide most of these organic addition agents do not cause an appreciable reduction of the current.

Furthermore, the author of this paper has not taken into consideration in discussing these addition agents that there are definite conditions with respect to the concentrations of sodium cyanide, cadmium metal, and other conductive salts under which each addition agent functions most efficiently as a brightener. These conditions differ very greatly for the different addition agents and the author has not indicated in his paper that these factors have been taken into consideration. Neither has he given the thickness of deposit of cadmium in each case when comparing the corrosion resistance due to addition agents added to the bath.

Furthermore, in Figure 2 showing the variation of corrosion resistance due to the increase in the size of holes in the barrel no statement of the thickness of deposit obtained is given and without question the increase in corrosion resistance is due to the fact that more cadmium is deposited on the work in a given length of time, due to the fact that the resistance of the equipment and solution is lowered by increase in diameter of the holes.

Any means for increasing the amount of cadmium on the work will, of course, increase the corrosion resistance and this factor should be taken into consideration when making the comparisons that the author makes in this paper.

The method of maintaining a constant percentage of cadmium in the solution by the use of the combination of steel and cadmium anodes is discussed but no mention is made of the anode and cathode current efficiencies. If the anode and cathode current efficiencies are equal the same amount of cadmium will be dissolved from the anode as is deposited on the work, thus maintaining a constant cadmium content of the plating solution. If sufficient cadmium anodes are used in the solution so that the anode current densities are not excessively high the anode current efficiencies as a rule are also high. Steel anodes acting as an inert anode result in a lowering of the overall anode current efficiency; if this procedure is necessary it is an indication that the cathode current efficiency is quite low. Considering the fact that steel anodes tend to some extent to effect the decomposition of the ingredients of the solution, it would seem far more advisable to work towards increasing the cathode current efficiency rather than decreasing the anode current efficiency to meet a low cathode current efficiency by the use of insoluble anodes. With a high cathode current efficiency it is only necessary to employ pure cadmium anodes and a certain minimum anode surface is required for maintaining the constant percentage of cadmium in the solution. The anode surface should not, therefore, be below this minimum but can be far above this. Thus, if an excess of cadmium anodes are used at all times the cadmium content of the solution is maintained without any difficulty, providing, of course, that the composition of the plating solution is such that no cadmium dissolves when the solution is not in use.

Mr. Loven indicates in this article that with six plating barrels using approximately 1,000 gallons of solution that twelve to fifteen tons per week of work is obtained. This production is apparently quite low per unit of equipment for it is quite common practice when employing six plating barrels operating approximately 500 to 600 gallons of solution to turn out 2,000 lbs. of work per day per barrel or a total of 36 tons per week on the basis of 10-hr. day and 6-day week. On the basis of the same number of barrels a production of over twice is obtained and on the basis of the same amount of solution approximately four times this production is regularly obtained with the better types of cadmium plating solution. It should be borne in mind, however, in the case of this larger production, that the work consists of small nuts and bolts of quite regular character and that a salt spray test of over 400 hrs. is required, whereas in the case of the work described by Mr. Loven which consists of small stampings the ratio of surface to weight is much greater. The ratio of surface to weight is of vital importance in cadmium plating for the reason that most of the work is contracted for and the estimate of cost also based on the weight whereas the actual amount of cadmium required and the time required for plating depends entirely upon the surface to be rustproofed. Assuming that the ratio of surface to weight was twice as great in the case of the small stampings there is still a great difference between the production obtained on the basis of the amount of solution used and on the degree of rustproofing obtained.

A great deal of difficulty is encountered in practice in plating small light stampings of different shapes and the author of this article has given this subject its deserved attention. The results of his experience are invaluable to anyone engaged in the plating of this type of work.

THE GRASSELLI CHEMICAL COMPANY,
Zinc Sales Dept., by Clayton M. Hoff.

Cleveland, O., July 15, 1928.

To the Editor of THE METAL INDUSTRY:

The comments of Mr. Hoff are of great value inasmuch as they show the reaction of the technical man to the data assembled, and the presentation of same. Forms of expression as used by one writer, do not always form the same mind-picture to the reader as the writer intended, and the writer is indebted to Mr. Hoff for raising the questions he did in relation to the article on "Cadmium Plating in Quantity Production" in the June, 1928, issue of THE METAL INDUSTRY.

The writer does not, however, agree with Mr. Hoff in all the points he raised and will, therefore, discuss each point separately.

1. Analytical Methods:

Referring first to methods of analysis the author wishes to quote from "Principles of Electroplating & Electroforming" by Blum and Hogaboom, p. 279, as follows: "Methods of analysis of cadmium solutions are very similar to those for zinc . . ." The method for determining cadmium content as agreed to by Mr. Hoff is perfectly satisfactory.

In spite of Mr. Hoff's claims that the method as given for the determination of total cyanide determines only the free cyanide, the author protests that this is not so. In fact the method may be used for determining the free cyanide and also the total cyanide. As the silver nitrate is added a slight amount of white precipitate of cadmium hydrate is formed after all the free cyanide has been used up. The formation of this precipitate, when all the free cyanide has been used up, constitutes a measure of the free sodium cyanide content. It must, however, not be confused with the true end point, that is, the appearance of the slightly yellowish turbidity caused by the formation of silver iodide. The author feels certain that if Mr. Hoff will try this method out using known solutions he will be forced to agree that it may be used for determining total cyanide.

Another method which may be used for determining

total cyanide and which has a sharper end point is as follows:

Pipette 5 cc. of the plating solution into a 100 cc. Volumetric Flask, dilute to the mark with distilled water and pipette a 25 cc. aliquot into a 300 cc. Erlenmeyer Flask. Add 50 cc. of water, 3 cc. of 28% ammonium hydroxide and about 10 drops of potassium iodide. The end point is reached upon the appearance of the yellow turbidity produced by the formation of silver iodide. Using this method no precipitation occurs as in the previous method.

Mr. Hoff rightly points out that the method for the determination of total alkali is more or less inaccurate as a strict analytical procedure. However, for practical purposes it has repeatedly demonstrated its value and is just as accurate for cadmium solutions as the method described by Blum & Hogaboom is for zinc solutions.

2. **Adulterants:**

As far as adulterants or addition agents are concerned the author agrees that for the same thickness of cadmium per unit area, whether deposited from a solution with or without addition agents the deposits probably have about the same corrosion resistance. However, many such adulterants have one serious drawback and that is, that they frequently render the deposit quite brittle and poorly adherent and this a serious matter particularly in barrel plating where the material is fairly heavy and there is considerable impact during tumbling. Cadmium in this manner ofttimes will chip off. Likewise for "still" plating where heavy deposits are required the deposit is rendered quite brittle and will chip off upon bending or under heavy impact.

Furthermore, where no such adulterants are used higher current densities may be satisfactorily employed, thereby increasing production. When addition agents are employed, good deposits may be obtained only at certain definite current densities which is not true of solutions containing no addition agents and furthermore since addition agents work better when the solutions are quite high in free sodium cyanide and metal content, such solutions are quite wasteful and the "dragout" becomes an important factor in so far as costs are concerned. Therefore, the maximum production at minimum cost is obtained from the more dilute solutions without adulterants.

3. **Thickness of Deposit:**

Referring to variation of corrosion resistance due to increase of size of holes in the barrel, the intention of the writer was to point out that it was necessary to find the largest possible hole, and to space the holes as close as possible, with due regard to the strength of the panel. It did not seem necessary to make a definite statement of the thickness of the deposit as very few plating rooms have the equipment necessary to make this determination, and furthermore, the corrosion resistance is roughly proportional to the thickness of the deposit. It has been my experience that while almost every plater or technical man is ready to state the value of a deposit, in terms of Saltspray Test, very few will know definitely what the corresponding thickness of deposit is, and furthermore, do not care, as it is the Saltspray Test which governs the acceptance or rejection of the product.

4. **Use of Steel Anodes:**

Regarding the type of anodes to use, Mr. Hoff makes the following statement:

"If an excess of cadmium anodes are used at all times, the cadmium content of the solution is maintained without any difficulty providing of course that the composition of the plating solution is such that no cadmium dissolves when the solution is not in use."

This statement while true, unfortunately, does not apply to commercial cadmium solutions because such solutions always contain more or less free cyanide (generally about 1 to 8 oz./gal. or more). Whenever an appreciable amount of free cyanide is present in a bath containing an excess of cadmium anodes the anode efficiency under commercial plating conditions ranges from about 100% to about 105%. The excess anode solution above theory is due to chemical or local action which manifests itself through the formation of pits of varying depth in the cadmium anodes. The almost universal pitting of straight cadmium anodes is mute evidence that considerable chemical action occurs. Since the electrolytic current efficiency of cadmium anodes when present in excess is practically 100%, it is plainly evident that the metal content of the bath must build up unless an excessive "dragout" is conveniently maintained to balance matters.

Furthermore the cathode efficiency especially when inert salts such as sodium or ammonium carbonate, sulfate, chloride or any other such material are present, is considerably lower than 100%. Under commercial conditions the cathode efficiency is probably seldom more than 92%. Current efficiency measurements have shown a difference between anode and cathode of about 10%.

The solution must of necessity build up in metal content thereby necessitating the addition of more sodium cyanide, etc., until because of excessive concentration of ingredients, portions of the solution must be discarded and the remainder diluted with water. To prevent this condition from occurring, steel anodes have been found to be practical on a commercial scale.

Steel anodes, if at all, have a very small effect on decomposing the cyanide in the solution. In fact, some authorities go so far as to say that steel anodes are desirable in that the tendency toward the formation of sodium carbonate is lowered materially by their use presumably because they oxidize cyanide less than does cadmium.

5. **Unit Capacity:**

Mr. Hoff also raises the point that the barrel unit from which the above data was obtained, was not worked to capacity during this period. That is true, and the only reason the writer mentioned the output figure was to show that the data was obtained from a production unit and not in a Beaker or small crock in the Laboratory. Since then we have increased the output of this particular unit and have been doing as much as 3,600 pounds per day per barrel in a 9-hour day, or a total of 60-ton per week and that, due to the kind and shape of the work, was the utmost that could be produced in this unit.

In closing my answer to Mr. Hoff's comments, the writer wishes to express his appreciation for the time and labor Mr. Hoff has expended in making these comments, and wish also to add, in my opinion, the best method of bringing out the difficulties in this field is to state them frankly and invite comment; may the exchange of views and opinions always be frank and cordial to the mutual benefit of all those who are engaged in the plating, and allied industries.

August 15, 1928, Bridgeport, Conn. OTTO H. LOVEN.

Chromium Solution

Q.—We would appreciate your advising us what, in your opinion, is the most practical solution for chromium plating a bright flashed deposit on nickel plated brass and die cast work.

A.—The following is a good formula for chromium solution:

Chromic acid	55 oz.
Sulphuric acid	3 c. c.
Water	1 gallon

Use lead anodes; 105° F.; and 75 amperes per sq. ft.

—OLIVER J. SIZELOVE.

Voltmeter, Ammeter, Rheostat

A Description of These Three Instruments; How They Are Made and Used—Part 2, Conclusion*

By F. T. TAYLOR
Vice-President, Hanson-Van Winkle-Munning Company

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, JULY, 1928†

THE RHEOSTAT

Now let's move on to the question of the rheostat and find out what this rheostat does and why it has to be there. Rheostats are of two general types, the so-called banjo or series type, and the so-called parallel coil type. The series type rheostat has an arm on it and a handle. When the handle stands in one position, the circuit goes up the handle, through a bunch of resistance, over across the tank to the other side of the circuit. You move that handle up you increase the current in a plating bath. What you actually do is to shorten up the resistance, cut out some of the resistance, and reduce the total resistance in the circuit—not by anything you have done in the tank at all, but by substracting some out of this series resistance. Now for flashing or other full line work, such as the plater calls running wide open, you throw the handle all the way around and your circuit is right through the rheostat and to all intents and purposes there is no resistance at all left in the rheostat. Such a rheostat was designed or rated to carry the maximum current that was expected of it when this arm stood just one segment cut in. It had enough resistance in it so that when the arm stood with all the resistance in the circuit, it had enough resistance in it presumably to reduce the line voltage, that is, to reduce the pressure, from anode to cathode, at its rated current, to one-half the generator voltage. In other words, it would cut your voltage down on a six volt circuit to three volts at rated current.

Now the series rheostat has certain advantages—simplicity. You turn the lever around or back. One disadvantage is that it is very difficult practically to put in enough segments, enough steps on the rheostat to give you a fair degree of regulation. In other words, you buy something to get pretty good regulation and find you have six or seven rather big steps and the variations of current you could get in your plating tank are coarse. And the reason it isn't practical to put more steps on the series rheostat is because in order to have the larger contacts necessary to carry the heavy currents, you would have to have a very large, expensive rheostat.

Now to get around that, the parallel coil type rheostat was developed, and as adapted to plating rooms, of course, it is an adaptation of the old parallel coil resistances used in the regulation of voltage in all meter testing rheostats by the electric light fellows for many years. There is nothing new about the principle. The diagram with this type of rheostat is exactly the same as the other. This parallel coil type of rheostat does in a slightly different way for you what the series coil rheostat does. Suppose we start moving the lever around in a circle, and suppose at this point here, two-thirds of the way around, let's say, it hits a stop post; it won't go any further. Then it must be evident that this part of the resistance beyond that stop post can never be cut out of the circuit. With this other resistance, we could swing the arm all the way around and cut all the resistance out of the circuit. Now in the parallel coil type of rheostat as ordinarily made, you have the same gradual reduction of resistance by manipulating the switches, but all of a sudden you come to a stop point and can't go any further. We have a series of resistance coils in parallel. What do you do? Well, you close a switch and that would represent the series rheostat when we had moved it up a little bit. We close another, and we have reduced the resistance, because we have provided two parallel paths instead of one, by closing the second switch. Let's close a third switch. We have reduced it again. And let's close the fourth one. We have reduced it again. Now let's close the fifth one. There is no fifth. You see, we have come up against a stop post. We still have some resistance in our circuit; we can't get it out. That right there is the second difference between the operation of the parallel coil type rheostat and the series coil rheostat, that is, the parallel coil type rheostat as it is customarily made.

Now to get around that, you have to put in a short circuiting switch, which would have the same effect as closing a switch across the last piece of resistance, short-circuiting out the rheostat. But without shirt-circuiting switch you can reduce your resistance in your parallel coil type rheostat to a certain degree and then you hit a stone wall and can't go any further. On the other hand one of the advantages of the parallel coil type rheostat is the large number of steps and graduations available. So that the parallel coil rheostat, despite this limitation of the last piece of resistance, gives you enough different changes of resistance to make it worth while in the circuit.

VOLTAGE CALCULATIONS

I want to show some of the very simple mathematics of rheostats in order to show what they do and why they work and why they don't do some of the expected things. Suppose we have a circuit, and we will assume that we have a plating bath and certain other things. I am assuming the voltage of the dynamo is six, and always stays at six. I am next assuming that we have a current of 20 amperes flowing in the circuit as shown on the ammeter. We have a cathode area in the tank of ten square feet. If that is so we have an average current density on that cathode of 20 amperes per square foot. We will call that CD. We will assume that we adjust this rheostat to .015 ohms. I am going to call that RR, the resistance of the rheostat. Those are the assumptions that I want to make. Now let's take Ohm's law. It is customarily written: $I = \frac{E}{R}$. That is familiar to all of you. There are two other forms in which that same thing

* Part 1 appeared in the issue of October, 1928.
† This article was prepared from a stenographic report of Mr. Taylor's blackboard talk before the Philadelphia Branch of the American Electroplaters' Society.

can be written; they are $E = I R$, or $R = \frac{E}{I}$.

Suppose I want to find out from this data I have here how much of my electrical pressure I have thrown away, eaten up, going across the resistance. The current is 200 amperes. Multiply that by .015 ohms and we have 3 volts. Here it is over here. $R \times I = E$. Simply using that version of Ohm's law, I find under those conditions three volts have been used up crossing that resistance. Well, we know before we start that this is a six volt circuit. Consequently, the voltage used up in crossing the plating bath was three volts. I am not trying to separate the IR drop or anode polarization through the solution and the cathode polarization, but the total voltage across that bath is three volts, and three volts across the rheostat, six volts total voltage of your dynamo. That is what you have under those conditions. You can see in a minute, if three volts is the drop here, the resistance of that bath is this, 3 divided by 200 equals .015 ohms. So we find over here in solving this problem that under those conditions we would have three volts across the rheostat and three volts across the plating bath; then the plating bath would have a resistance, R, of the tank, which would also equal .015 ohms. That is your check.

Suppose now we made a change in this problem I have given to you. I said that we had ten square feet of surface running at 20 amperes per square foot. We had .015 ohms in the rheostat then. Now the change I want to make is this. I want to leave the rheostat exactly the way it is, and cut the cathode area one-half. Your cathode area would then be five square feet, and the cathode resistance would go up to .03. It is doubled because there are only half the number of paths for the current to cross that tank. If that is the case, we will figure out now what happens. The current, I, would equal E divided by R. That would make it

$$\frac{6}{.03 + .015 = .045} = 133\tfrac{1}{3} \text{ amperes.}$$

You haven't changed the rheostat; you have changed the cathode area and your current would drop. But what would happen to the current density? 133⅓ divided by five, makes 24.6 amperes per square foot. In other words, your current density has gone up. Furthermore, you would find that where we originally had three volts drop in the first place, under this new condition of reducing the cathode area without changing the rheostat setting, you would find we now have 2 volts drop in your rheostat and 4 volts drop in your tank. Something that you have done with the tank, not the rheostat, has caused it.

Now in order to get these conditions back, suppose you wanted to maintain the 20 amperes per square foot, regardless of whether you have five square feet or ten in the tank. That is what the rheostat is for. The rheostat is to give you an opportunity of maintaining constant current density. Here is how you will do it. We know that if we want 20 amperes per square foot on five square feet of work, we have 5 times twenty, and we must have flowing through our circuit 100 amperes. How are we going to do it? Six volts divided by 100 amperes gives us .06 ohms. Now we know we must have somewhere, the total resistance in this circuit, must be .06 ohms. Well, if our 5 square feet of surface gives us a resistance of .03, we get .06, subtract .03 from it and we know we have to have .03 left in the rheostat; or in other words, if we change the setting of the rheostat, change the switches around now until that rheostat gives you not .015 ohms, as it did originally, but change it until it gives you .03, that .03 added to the .03 of the cathode, the tank, you have your .06, you have here 100 amperes flowing, you have your 20 amperes per square foot, even on the reduced cathode area. That is how you manipulate the rheostat to compensate for the changes caused by an increase or decrease of cathode area in the tank.

RHEOSTAT SWITCH MARKS

In closing, I want to explain one other thing which has puzzled many, and I am not surprised at it. You have all seen these parallel coil type rheostats, and you have all looked at the switches and noticed that they were marked a certain number of amperes and you have thrown a switch in and got nothing of the sort on the meter and wondered why the thunder it was that it didn't work; in other words, the meter didn't read right, or something had gone askew. That isn't true. What is true is that the marking of 20 amperes or 30 or 40 amperes on that switch is a perfectly good marking when you understand what that marking means. But as a prophecy of what is going to happen on the ammeter when that switch is thrown, it is not very good. It has a different meaning entirely. All these parallel coil type rheostats, are designed, to do something. They have to be designed according to certain assumptions, and the assumption generally made is that if you were to secure a rheostat which would give you a chance to cut the line voltage as low as half, then you would have plenty of cut down in the rheostat, and by the same token, plenty of voltage left in the tank. So that those coils are designed on the so-called 6 volt rheostats to give a three volt drop at the current marked on the switch. But I have just shown that the thing to determine how much current was being dragged through this particular rheostat was what you did down here in the tank. The change that you make in your surface work is what actually tells whether or not this amount of current is going to be pulled through that coil. The coil merely promises that it will produce a three volt loss of pressure for you when that much current is dragged through it. That is all that marking on that switch can mean. Now suppose we take this particular coil that I have shown here, let's see how that would be wound. That 30 ampere coil is going to drop three volts when 30 amperes are dragged through it. When the coil maker goes to wind it, he winds until he gets just one-tenth of an ohm worth of resistance in that wire, and he chops it off and hangs it on some support. Now once he has put the one-tenth of an ohm on he has fulfilled his promise, from Ohm's law, that when you drag 30 amperes through that coil, you get half line voltage in that rheostat. Suppose you don't pull so much through? If you pull 20 amperes through that coil, you would get one-tenth of an ohm multiplied by 22, or two volts drop through the coil, and four volts would be left across your tank, two volts through the rheostat, and not three volts. There would be a case where it is not giving you the three volts drop that it has promised to give you. But it didn't give it to you because you only dragged 20 amperes through it. Suppose you dragged 40 amperes through it. Now you would get 4 volts drop through the rheostat, and would have only 2 left from anode to cathode in the tank. But you would have something worse. This coil is made to carry 30 amperes. You overload your tank and 40 amperes go through a coil wound to carry without overheating only 30 amperes. You overload the coil, and it is red hot. And remember that when a coil that is built to carry 30 amperes is made to carry 40 amperes, it does not get 40-30 hotter, but unfortunately it gets 40 × 40 divided by 30 × 30 hotter, and that is a good deal hotter; 4-3 you see is 1⅓, but 1,600 divided by 900 is a good deal near 2 to 1. In other words, the overloading of that coil is closer to 2 to 1 than 1⅓ times, as the simple ratio would be.

Questions on Plating Practice

Q.—We are operating four nickel baths, three of which contain prepared (double) nickel salts, while the fourth has single nickel salts. The metallic nickel content, per gallon, of the first three is under 2 ozs., while the fourth tank has a content of 3.62 ozs. per gallon. The first three tanks, furthermore, stand at 10° Baumé; each is 400 gallons. We are under the impression that the metallic nickel content of such solutions should always be at least 2 ozs. per gallon. We do not add anything to these solutions except boric acid, once a week. We plate nickel on steel, teaspoons, tablespoons, knives, etc. Do you think the nickel content of our solutions should be higher? We intend to use a movable cathode rod. Will we need to build up our solutions for such operation? What additions are needed?

We expect to install a semi-automatic steel tank for silver plating. Our present intention is not to line the tank. Do you think this is a good plan?

We have a steel tank that holds about 150 gallons. Would this be suitable for a silver strike? Does it need to be lined? If so, what kind of lining do you recommend?

What is a formula for a bright silver solution? What is one for a silver strike?

We expect to nickel plate articles for about 15 minutes, then place in silver bath for about 20 minutes. The base is cold rolled steel. What is the best way to remove articles from nickel tank, to place them in the silver bath? What kind of anodes are used in the silver strike? Do you think that rubber coated racks will tarnish the work? We have never done any silver plating and we thought your advice would be of great aid. Is there a good, practical book on silver plating that we could use to supplement the information you give us?

From the point of view of health, what precautions are necessary where large amounts of cyanide are used?

A.—Still nickel plating solutions with metal content of 2 ozs. per gallon give a better distribution of the deposit than those higher in metal.

Automatic nickel plating solutions should have a higher metal content, preferably 4 ozs. of metal per gallon. Use single nickel salts in building up solutions.

Have steel tanks lined with pitch to make them suitable for silver plating solutions.

Formula for sliver solution:

Silver cyanide	4 ozs.
Sodium cyanide	6 ozs.
Ammonium chloride	¼ oz.
Water	1 gal.

For a brightener, use carbon sulphide which has been dissolved in a small quantity of the plating solution and a large excess of sodium cyanide. Use sparingly.

Formula for silver strike:

Silver cyanide	½ oz.
Sodium cyanide	8 ozs.
Water	1 gal,

Rinse articles in clean cold water after nickel plating and place directly in silver strike. Use anodes of cold rolled steel. Racks that are insulated with hard rubber are being used successfully in silver plating with no bad effects.

"Principles of Electroplating and Electrodeposition," by Blum and Hogaboom, which can be purchased through THE METAL INDUSTRY is a good book on all kinds of plating.

The writer is operating several thousand gallons of cyanide solutions and the health of none of the operators has been impaired. Cleanliness should be the main object in operating cyanide solutions.

—OLIVER J. SIZELOVE.

Copper Plating

Q.—We are copper plating the ends of high-resistance carbon sticks and we are interested in methods of speeding up our tanks. Is there any kind of a wire which will not copper coat? We are using a baked enamel wire to carry the current to our racks. This requires constant attention and painting and it seems to be hard to keep the racks in good condition. We had an idea that aluminum wire would not copper coat, but it seems that we were mistaken.

Is yellow dextrine a collodial agent? Is there any preparation on the market for use on the hands of those who are working around the tanks?

A.—There is no metal that I know of that could be used in making racks that will not be coated with copper during deposition. You should have racks covered with a hard rubber composition. See advertising pages of THE METAL INDUSTRY for firms that make such equipment.

Yellow dextrine is a collodial substance and, if used in the acid copper bath, care must be taken to avoid an excess, which will cause a dark deposit.

Acid copper solutions do not, as a general rule, affect the hands of those working around the tanks. However, if the hands of the operators become sore, we would recommend the use of a boric acid solution for a wash at the end of the day's work, followed by a rub with alcohol and glycerine.

—OLIVER J. SIZELOVE.

A Railroad Plating Shop

At the general shops of the Southern Pacific Company, Sacramento, California, there is one of the best equipped plating works west of Chicago. This department repairs, replates where necessary, and refinishes all silverware used in dining cars, business cars, etc., as well as trimmings and fixtures, such as sash and door locks, lamp frames, hatracks, etc., for passenger cars operating principally over the so-called Northern District of the Southern Pacific.

On account of the acids and chemicals used in the various processes, special attention is given to ventilation. The room where the plating tanks are situated is perfect in that respect, having large ventilators in the ceiling and the upper half of the windows fitted with screen wire; these are left open winter and summer alike, insuring an abundance of fresh air at all times.

The tanks and cement floors are washed off daily, washing being preferable to sweeping as the dust to be found on the floor of this room is not very pleasant to inhale. To conserve the health of the men in the polishing room, this is equipped with a system whereby the dust created in polishing is drawn from the room and deposited on the outside of the building. In addition to daily sweeping of the polishing room, it is subjected once a week to a special cleaning, accumulated dust being removed from the walls and ceiling by vacuum cleaner. The fire risk is thus minimized.

—C. W. GELGER.

Electroplating Research

Progress Report of Research on Electrodeposition, July 1, 1927 to June 30, 1928, at the U. S. Bureau of Standards, Washington, D. C.

By DR. WILLIAM BLUM
Chief of Division of Electro-chemistry, Bureau of Standards

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS SOCIETY, SEPTEMBER, 1928

I. **Personnel.** During this fiscal year three members of the section resigned to accept commercial positions, viz.: H. E. Haring, J. H. Winkler, and R. A. Dimon. This caused considerable interruption of the research work as it was necessary to engage and instruct other persons, most of whom had little actual experience with research in this field. One encouraging feature of these changes in personnel, however, is the evidence of an increasing demand from industry for persons qualified to conduct and apply researches on electrodeposition.

The present members of this section and their principal duties are as follows:

William Blum, Section Chief; M. R. Thompson, Assistant Section Chief, Cyanides; H. R. Moore, Principles of Chromium Plating; N. Bekkedahl, Cyanides and Miscellaneous Analysis; G. E. Renfro, Properties of Chromium; A. B. J. Clark, Miscellaneous Plating; W. P. Barrows, Research Associate of American Electro-Platers' Society, Spotting Out; H. L. Farber, Research Associate of American Electro-Platers' Society, process of chromium plating; R. O. Hull, Research Associate of International Association of Electrotypers, addition agents in acid copper solutions.

Owing partly to the changes in personnel, no large investigations were completed during this year. The progress and status of each of the projects may be briefly summarized as follows:

II. **Researches.** Fig. 1. Chromium Plating. The widespread interest in chromium plating is indicated by the receipt of about 100 inquiries per month on this subject in addition to the requests for Technologic Paper 346, of which over 3,500 copies have been sold by the superintendent of documents since it appeared in June, 1927. In addition, over 100 persons visited the Bureau during the year to obtain information on chromium plating. About fifteen addresses on this subject were given to local sections of various technical societies, by whom the traveling expenses were paid. Incidental to these trips a number of plants engaged in chromium plating were visited. Through all these contacts and through the literature on this subject we have endeavored to keep in touch with the progress of chromium plating and to determine which phases of it are in need of further study. Our present program for studies on chromium plating includes the following subject:

(a) **Principles.** Experiments are in progress upon the conductivity and other properties of chromic acid bath, in order to determine their constitution and especially the form and function of the basic chromate.

(b) **Process.** Measurements are being made of the throwing power during chromium plating under different conditions of operation. Even though it may not be possible to produce a marked improvement in throwing power, it is highly desirable to know what composition, temperature and current density yield the best results.

Subsequently a study will be made of the favorable conditions for producing chromium deposits with any desired appearance, hardness, and protective value, upon different metals including brass, steel and iron, aluminum, zinc, nickel, tin and various alloys. Progress reports will be issued as each phase of this work is completed.

(c) **Properties of Chromium.** As chromium owes its value to specific properties, it is desirable to measure these properties exactly and to determine their relation to the conditions of deposition. Specimens have been or will be prepared by this section for the measurement by various divisions of the Bureau of such properties as hardness, wear resistance, coefficient of expansion, specific gravity, color, reflecting power, melting point, conductivity, tensile strength, surface tension (wetting by water and by oils), resistance to oxidation and chemical action, porosity and protective value. The preparation of suitable specimens may require much time and ingenuity.

(d) **Cooperation with Other Government Departments.** Chromium plated printing plates have continued to yield good results at the Bureau of Engraving and Printing and seventy-five per cent of the paper currency and postage stamps are now being printed from these plates. The baths have required no attention except the routine analyses for maintaining their composition.

At the U. S. Mint in Philadelphia a small chromium plating unit was installed. Chromium is givng satisfactory results on steel collars, plaques used for producing the steel dies, and various parts of the mechanical equipment. The results on the coinage dies are promising, but not yet conclusive.

We have prepared chromium plated specimens for use in a study now in progress at the U. S. Bureau of Chemistry and Soils upon the suitability of chromium for food containers and cooking utensils.

Having received numerous inquiries upon the health hazards in chromium plating, we have arranged to cooperate with the U. S. Public Health Service in at least a preliminary survey of the ventilating conditions in chromium plating plants, and the possibility of injury to the health of the operators.

We are cooperating with the Federal Specifications Board in the preparation of a specification for chromium plating on plumbing fixtures. Information and samples have been obtained from numerous manufacturers to furnish a basis for this specification. Numerous other government departments have requested information on chromium plating or have submitted articles to be plated for their use.

2. **Spotting Out.** Most of the year was spent in a study of the crystal spotting which occurs only on lacquered sulfide ("oxidized") finishes. The results have been published and distributed to the subscribers to the Research Fund. They indicate the possibility of greatly reducing this difficulty by excluding sulfur or sulfur compounds from access to the finish. This may be done most effectively by wrapping the articles

in wax paper or by applying a very thin film of grease to the surface.

The results so far obtained on the stain spotting will be separately reported by W. P. Barrows to this convention.

3. **Cyanides.** A large proportion of plating solutions contain cyanides, and as they are much less stable than the neutral or acid baths they require more frequent attention and adjustment. Before making a detailed study of the important cyanide plating solutions, it was necessary to obtain reliable information upon the composition and analysis of commercial cyanides.

Some very pure sodium and potassium cyanide have been prepared from pure liquid hydrocyanic acid, and have been used to test the accuracy of the methods of analysis. This information will next be applied to the analysis of plating solutions, including the determination of "free cyanide."

4. **Iron Deposition.** During the year the Bureau of Engraving and Printing has made further experiments upon the deposition of thick iron plates to which reference was made in last year's report. While promising results have been obtained the process is not yet in regular operation. The results at least show that it is possible to produce relatively smooth iron plates (¼" thick) from a bath containing ferrous chloride and calcium chloride, at a temperature of 90° C. (194° F.) and a current density of about fifty amp./sq. ft. The details of operation will be published as soon as the process is thoroughly worked out.

5. **Copper Electrotyping Solutions.** In electrotyping, the copper deposits or "shells" are about 0.006" thick. At a current density of about 60 amp./sq. ft. such as is commonly used in agitated electrotyping baths, it requires about two hours to produce such a shell. It would be desirable in many cases, especially for rush orders, to greatly reduce this time of deposition.

Organic addition agents are frequently used in such solutions to produce smoother deposits, and to reduce the treeing that is likely to occur at high current densities. A study is being made of the maximum current densities that can be used with and without addition agents; and of methods of determining and controlling such agents as may prove advantageous.

III. **Future Plans.** The researches outlined above will probably consume most of the next year. At or before the next convention we hope to report definite results on a number of these projects. In the meantime we will confer and correspond frequently with the members of your Research Committee and other members of your Society who are interested in these problems.

That platers and manufacturers are interested in research in this field is indicated by the attendance of over seventy-five persons at the research conference held at the Bureau of Standards on March 2, 1928. The support of the Electro-Platers' Society was still further demonstrated by the decision to engage another Research Associate to work upon chromium plating.

We have added to our equipment and facilities to meet the increase in personnel and will make every effort to obtain results in all these researches that will be of value to the electro-plating industry.

Nickel Under Chromium Plate

Q.—What is a good nickel formula for producing a plate that will take a chromium deposit? I have made some experiments but have found that no matter how much care I take to make the nickel adherent, the chromium deposit lifts it off.

I would also like to have a formula for a good, bright chromium deposit. I want to use it on automobile parts.

A.—To successfully chromium plate automobile work requires careful handling. The nickel deposit must be soft. Old deposit should be removed from the work and a good polishing operation performed.

Steel work should be copper plated and buffed, then nickel plated and colored. It is not necessary to copper plate brass work. The following is a good nickel solution formula. Use this solution warm, preferably at 120° Fahrenheit:

Double nickel salts	8 ozs.
Single nickel salts	4 ozs.
Boric acid	2 ozs.
Ammonium chloride	2 ozs.
Water	1 gal.

Formula for chromium solution:

Chromic acid	55 ozs.
Sulphuric acid	3 c. c.
Water	1 gal.

Use at temperature of 105° F.; 75 amperes per sq. ft. Use lead anodes.

Your present nickel solution can probably be made to work. Send us a 2 oz. sample for analysis.

—Oliver J. Sizelove.

Enamel and Lacquer on Metal

Q.—We are having a great deal of difficulty in finding a method of filling with enamel or lacquer plates requiring a colored background as per sample herewith enclosed. If a satisfactory oxidizing formula is available to obtain the same green color as this sample, we would like to know about it.

Any further suggestions as to the best method for getting results will be appreciated.

A.—There is no chemical method of producing the green color same as sample sent. This is a lacquer enamel finish and any of the lacquer manufacturers that advertise in The Metal Industry can supply you with the exact shade of green. Sample plate after etching has been sprayed with enamel and highlights relieved on a felt polishing wheel coated with a fine grade of emery. After relieving operation, it was finally lacquered with clear lacquer to prevent the highlights from tarnishing.

—Oliver J. Sizelove.

Baumé Chart

Q.—Where can we get a chart on nickel sulphate solutions, showing either degrees Baumé, Twaddell, or specific gravity, with their corresponding percentages of nickel representation. Our bath contains water as a solvent with nickel sulphate single salts dissolved ($NiSO_4.7H_2O$). The temperature is around 77° F., approximately room temperature.

A.—There is no such chart that we know of. Write to the Bureau of Standards, Washington, D. C.

—Oliver J. Sizelove.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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Contents

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Editorial

The Foundry Industry

A trustworthy index of the condition of the foundry trade is embodied in the report of the Department of Commerce on the census of manufactures for 1927 of foundry supplies. This report states that establishments engaged primarily in the manufacture of foundry supplies in 1927, reported products valued at $11,635,060, a decrease of 8.6 per cent as compared with $12,723,120 for 1925, the last preceding census year. The number of wage earners fell off 13.4 per cent and wages decreased 11.8 per cent. The establishments classified in this industry are those making foundry facings, molding sand, cement for castings, core oils and compounds, chaplets, wax, fluxes, parting compositions, flasks, sieves, pipe blacking and plumbago.

This is a true cross section of this class of industry, which rises and falls with the direct foundry business. To be sure, brass foundries form only a part of the general foundry business, perhaps a minor part, but they follow the general trend of the industry and the indications are that this business as a whole has been suffering.

The entire foundry business is difficult to encompass since its component parts are so different in their characteristics and problems; in some ways almost competitive. For that reason, associations have sprung up to guard the business interests of particular groups. The American Malleable Castings Association and the Steel Founders' Society of America cover two fields. The Gray Iron Institute stands for a third. Where are the brass founders?

The American Foundrymen's Association has organized a committee to promote the use of castings in general. On this committee, which is strictly educational, will be two representatives from each branch: gray iron, malleable, steel and non-ferrous; two men from the foundry equipment industry; and two from the foundry supply industry. This will be fair to the casting industry as a whole, but it does not change the fact that the brass founders, as a class, have no national organization of their own comparable with those in existence in other fields. The old American Brass Founders' Association, organized about 1907, might have developed into such a group but it later became the Institute of Metals, a purely technical society.

The brass founders of the United States can take a leaf from the book of the iron founders. The recently formed Gray Iron Institute has pointed the way. They start out with a simple admission of a well known fact. "It is generally admitted that gray iron castings have not sustained their rightful prestige in industry." Pointing out that gray iron has suffered from disparagement by other industries, ignorance of users about recent developments and improvements in iron, lack of standardization of grades and qualities, and the loss of confidence by engineers in cast iron because of its non-uniformity, this Institute intends to correct this situation. By means of publicity, it will combat unfair comparisons, it will publish reports of improvements in gray iron casting technique, develop a standard grading or classification, with recommendations for the use of these grades in various parts of engineering equipment and supplies.

Other major activities will be as follows:

1. The development of new markets, uses and products.
2. The starting and undertaking of research work toward the improvement of quality.
3. The distribution of information concerning methods of manufacture.
4. The effort to reduce the waste caused by excess foundry capacity.
5. A study of new merchandising methods.
6. The adoption of a uniform code of ethics for trade customs.
7. The promotion of uniformity in methods of cost accounting.

Some of the activities listed above are the objects of work by other organizations, such as the American Foundrymen's Association, but the work of the Gray Iron Institute presumably will supplement any such outside efforts, not compete with it.

We commend the principles of this Institute to the brass founders. A national trade association along these lines, capably conducted, would go far toward preventing many of the evils now in existence, which keep the brass foundry industry from earning the profits which it rightfully deserves.

Tin Consumption

An illuminating report from the Bureau of Mines gives the result of a canvass early in 1928 to ascertain the amount of tin consumed by each of the various uses in the United States in 1927. Eliminating secondary tin, this survey accounted for a little less than 69,000 long tons of primary tin, about 97 per cent of the total imports for that year.

As expected, tin plate and terne plate were the largest consumers, taking 35.65 per cent of the total. Other important consuming industries were solder, 19.96 per cent; babbitt, 12.66 per cent; tin foil, 6.10 per cent. Other uses such as bronzes, castings, collapsible tubes, tinning brass and copper articles, and chemicals consumed between 3 and 5 per cent each. The rest were divided among scattered industries.

The total consumption of tin in the United States for 1925 was 117,406 long tons, but this figure included both

primary and secondary tin. The Bureau of Mines will continue its effort to determine actual consumption and in the canvass for 1928, plans to include the consumption of secondary tin and also the consumers' stocks.

The long standing agitation to find a substitute for tin makes especially interesting an item which recently appeared in the daily press. According to E. R. Crawford, president of the McKeesport Tin Plate Company, all efforts have failed to find a substitute for tin that could be used in the food-packing industry. Experiments have proved that tin makes the best hermetically sealed package for the preservation of food. Mr. Crawford's view is that this fact is the reason for the increase in the manufacture of tin plate from 8,000,000 base boxes in 1891 to 40,000,000 base boxes per year at the present time.

The outcry against the use of tin has subsided somewhat with the fall in the price of tin from over 70 cents to its present figure of about 48 cents per pound. Nevertheless, work is still going on to find a substitute for a metal of which we use so much and of which we produce so little. Will sheet aluminum be the answer? Or an electro-plated product? Or some other, perhaps unthought of at this time?

Copper Still Rising

Copper continues to gain in price almost daily. Consumption increases in old lines, and new lines are cropping up. A prediction in the October bulletin of the Copper and Brass Research Association by Commodore Herbert Hartley, points out that the development of the United States Merchant Marine under the Jones-White bill to encourage American shipping will create a greater maritime demand for copper than our shipyards have ever known before. The fleet of four-day liners which will shortly be constructed in the United States will alone require a total of 16,500,000 pounds of copper. On the other hand, we are faced with the fact that the world is increasing its output of copper, according to estimates of the American Bureau of Metal Statistics. The daily average of copper produced in the world was over 5,150 tons in September, 1928, as compared with about 5,125 tons in August, 1928, 4,942 tons in July, 1928, and a daily average so far in 1928, of 4,926 tons. With prices rising this increase of production will continue. If it goes too far, it will catch up with and soon outstrip consumption, and then the process will be reversed.

There is no doubt that progressive copper producers are anxious to keep prices in hand, so for that matter are the bulk of copper consumers. The time for action may not be here at this moment, but it is certainly not far off. Too high prices for metal can be just as injurious to the industry as too low.

We can only repeat our statement of last month in these columns, that a fair profit for producers, reasonable prices for consumers and a stable market are absolute necessities to the industries which produce and consume copper.

Chromium Plating Hazards

The typical chromium plating solution consists mainly of chromic acid. So far it has been found impossible to prevent the liberation of a considerable quantity of hydrogen and oxygen together with a spray of chromic acid into the air. For that reason, the United States Public Service has made a study of the hazards involved in chromium plating, assisted by the Bureau of Standards.

In the manufacture of chromic acid and chromates, it is an old story that operators are subject to ulcers and what are known as "chrome holes" in the nose and on the hands. Consequently, provisions have had to be made for special ventilation in the chromic acid plants and also in chromium plating plants. In spite of the precautions that have been taken, however, in a number of instances men have been affected injuriously.

The survey of the Public Health Service included a study of methods and degree of ventilation, the concentration of chromic acid in the air breathed by the workers and a physical examination of the workers themselves. In a study of six plants and twenty-three persons, the results were very consistent and allowed the formation of certain tentative conclusions. Tests showed that 1 milligram of chromic acid in 10 cubic meters of air (1/60 of a grain in 350 cubic feet) will cause nose bleed and nasal inflammation within a week. Higher concentrations or longer exposures may result in complete perforation of the nasal septum.

There is, therefore, unquestionably a real hazard in chromium plating but it can be entirely eliminated if suitable measures of prevention are taken.

The Public Health Service recommends the following precautions.

1. An effective system of ventilation in which the air is drawn horizontally across the plating tanks into a narrow duct in which the air velocity should be about 2,000 feet per minute.
2. Rubber gloves, aprons and shoes should be worn.
3. There should be frequent applications of vaseline or mentholatum salve to the nose and hands.
4. All cuts and abrasions of the skin should receive regular inspection and medical treatment.

These measures are comparatively simple and their efficacy depends only on the care with which they are observed. There is no excuse, therefore, for injury to men working in a chromium plating plant.

Strayed Mail

During the last four months, a considerable amount of our mail has gone astray. The cause is being investigated but has not yet been determined. We ask our readers, therefore, to co-operate with us if they have had any difficulty in their correspondence with us. If your letters have gone unanswered, please send us copies of the correspondence. We hope that this difficulty will be eliminated shortly and that all questions will be answered in due course.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Antique Bronze Finish

Q.—We are mailing you under separate cover two radio escutcheon plates, one with a bright dipped finish and the other in a brown finish. We would like to put the same finish on the bright dipped plate as on the brown plate but have been unable to match the color. If you are in position to advise us how it is done and what is used to do this, we would be pleased to hear from you.

A.—We presume the plates are made of a composition of 90 copper, 10 zinc. The finish you want is called Antique Bronze. Proceed as follows:

Acid dip the plates to obtain the bright finish shown on your sample. Brush down with bristle brush wheels and a polishing medium made of stearic acid, tallow and flour pumice stone or silica. These materials can be obtained from supply houses, for which see Buyers' Guide at back of this magazine.

After polishing, cleanse under usual conditions for plating. Then plate in the following solution:

Water	1 gallon
Sodium cyanide	4 ozs.
Carbonate of ammonia	2 ozs.
White arsenic, powdered	4 ozs.
Sodium sulphate	2 ozs.

Dissolve the arsenic and carbonate of ammonia in a pint of water at 160° F., then add the sodium cyanide dissolved in another pint of water heated to 120° F. Mix the two solutions together thoroughly, then add the balance of the water cold, and finally put in the sodium sulphate. The anodes should be sheet steel and plating should be done with current of 3 to 4 volts.

After dark bronze plate has been obtained in above manner, wash the plates in cold and boiling waters, dry out in sawdust and brush down as first outlined. Cleanse afterwards and lacquer by spraying.

It might be possible to omit the first bristle wheel brushing; it might be necessary, however, to sandblast the surface of the plate with a low pressure blast, using the finest of flour carborundum as abrasive. (Ground glass can also be used.) All the data can be modified to meet conditions as found desirable and practicable.—C. H. P., Problem 3,795.

Bronze Coating on Glass

Q.—Do you know of a process for bronze electroplating on glass?

A.—There is no method of bronze plating directly on glass. It is necessary to coat the surface of the glass with a metallic powder first. The powder, knowns as platers' copper bronze, is mixed with a lacquer medium obtained from lacquer manufacturers, in the following basic proportions: 1 pound copper bronze to 1 gallon lacquer.

Sand blasting the glass first helps to make this metallic coating more adhesive than if it is put on the polished glass surface. The mixture of bronze powder and lacquer should be sprayed on the glass. Two coats, at least, are necessary to cover the glass thoroughly. Drying between the coats is essential. When the second coat is dry and hard, the surface can then be electroplated in a regular acid copper bath, to any desired thickness. The following solution is used commercially for this purpose:

Water	1 gallon
Copper sulphate	28 ozs.
Sulphuric acid, 60°	4 ozs.
Yellow dextrine	⅛ oz.

Voltage, 1 to 2; amperage, as required.

The only cleaning required before plating is immersion in a cynanide dip to remove oxide from the copper bronze powder surface.

After the surface has been plated with copper to a sufficient thickness, any other metallic finish can be deposited on the copper by electroplating, such as bronze, brass, silver, nickel, etc., by use of regular plating solutions. Since glass is not metal, the whole coating of the glass will not be as adherent as an ordinary plate on metal.—C. H. P., Problem 3,796.

Brightening Pennies

Q.—For a certain novelty which we are planning to manufacture, we need bright pennies. We cannot get these from the government, so we find it necessary to brighten and polish old pennies in quantity.

We thought we could do this by chemical treatment and tumbling. Can you give us any suggestions?

A.—Use the following method:

Immerse the pennies in a hot cleaning solution consisting of

Water	1 gallon
Caustic soda	4 ozs.
Sodium cyanide, 90-98%	½ oz.

at a temperature of 200° F. After a few minutes the pennies will be clean. Then remove them and wash in cold and boiling waters, then dry out in hard wood sawdust. After this is done, arrange a stoneware jar of nitric acid, 38°; put the pennies in an aluminum wire basket (other metals are eaten by the acid). Immerse the basket of pennies in the acid, shake, withdraw immediately and drain off the excess acid. Then wash them in cold and boiling waters and dry out in sawdust as previously. If a still brighter lustre is desired, the pennies should be immersed in a second acid dip made as follows:

Nitric acid, 38°	2 quarts
Sulphuric acid, 66°	1 quart
Water	4 ozs.
Muriatic acid	⅛ oz.

Mix the acids and water in the order given and use when cold. To maintain the acids in a cool condition, surround the earthenware containers with cold running water. Immerse the pennies in the second acid dip for a moment or two, remove quickly, wash in cold and boiling waters and dry in sawdust.—C. H. P., Problem 3,797.

Heavy Nickel on Tin Coating

Q.—The writer has the problem of depositing a coat of nickel that must be fairly ductil about .040 in. thick, on a non-conducting object that is sensitized with a coating of tin put on with a Schoop gun.

Up to this time I have used a hot "Watts" solution and seem to have trouble. When the plating is first started, dark, almost black, spots develop. They seem to be removed fairly well by raising the amperage considerably, but I do not like to do this. My thought was that possibly there might be a better solution for plating on tin to get a thick, ductile coating. I carried the acidity of the "Watt" solution at 5.8 to 6.0 pH.

If you recommend any other solution, I would appreciate fullest details as to current density, pH, temperature, etc. Would the "Watts" solution be capable of being speeded up by any additions, and what should be used to do it?

A.—The addition of sodium acetate to the "Watts" solution may solve your problem. Add from two to four ounces for each gallon of solution. The pH of 5.8 to 6.0 is correct, but might be raised to 6.2 without injury. As a rule it is advisable to plate with nickel over articles having a metallic tin basis, using a fairly dilute solution. Afterward, this can be plated again in the "Watts" or a similar solution with fairly good metal concentration—3 or 4 ozs. metallic nickel per gallon—to get the desired thickness of

soldering and for use with "DE" as a second solder; "TL," for deposit. As a basic solution, for the first plate of nickel, use the following solution:

Water	1 gallon
Single nickel salts	6 ozs.
Boric acid	1 oz.
Ammonium chloride	1½ ozs.
Sodium perborate	1/15 oz.
Acetic acid.....Enough to give pH of 6.0 to 6.2	

The addition of up to 4 ozs. sodium acetate per gallon should increase the rapidity of the deposit of nickel. Maintain the pH constant with the 85% acetic acid. Both of the latter factors control hydrogen, and thus allow for an increase in nickel deposit at higher current densities, and a more malleable nickel deposit results.—C. H. P., Problem 3,798.

Mercury Dip for Copper

Q.—Please give me directions for securing a coating of mercury on copper or iron by dipping.

A.—Use the following dip:

Water	1 gallon
Mercuric chloride	4 ozs.
Nitric acid	⅛ oz.

The copper will immediately take a coating of mercury, but the iron will have to be copperized first and then dipped in the mercury solution. Copperize in this solution:

Water	1 gallon
Copper sulphate	2 ozs.
Sulphuric acid, 60°	1 oz.

If the steel is clean and dry, it will become coated with copper immediately after it is dipped in the copperizing solution. It should then be washed in water, after which it should be immersed in the mercury dip.

Another mercury dip consists of the following:

Water	1 gallon
Sulphuric acid	16 ozs.
Mercuric chloride	1 to 2 ozs.

For light mercury coatings, a dip composed of 1 gallon water, 6 ozs. sodium cyanide and ¼ oz. mercuric oxide can be used.—C. H. P., Problem 3,799.

Removing Enamel from Steel

Q.—We have been referred to you for a process for removing porcelain enamel from sheet steel. Some time ago we learned that a stove company in Michigan was removing enamel from sheet steel by passing an electric current through a muriatic acid solution after making an electric contact with the work. The solution is used warm and the process is similar to electroltyic plating, only the reverse. The process has a tendency to re-pickle the steel to a certain extent.

Our business is the enameling of sheet steel. We have quite a bit of defective enamel work and we are anxious to learn whether or not the above process will serve for the removing of enamel as above stated. As we are not familiar with electrolytic plating and we are anxious to experiment along this line, we would appreciate it very much if you would kindly give us some information that will help us in the work. Also, if you know of any other process that might serve, we would be very pleased to hear from you.

A.—There is no reason why the method you mention cannot be employed to remove vitreous enamel from sheet steel. This method is used in electro-cleansing and electro-pickling of sheet steel.

For your purpose, you would require a cypress wood tank of suitable dimensions, lined with pure lead sheet not less than ⅛ in. thick. The seams of the lead must be joined by lead burning or welding. The solution must be heated with steam coils which are also of lead. In this process, the steel to be cleaned is made the anode. The enamel would have to be removed from the point of contact with supporting hooks which are preferably of copper. For cathode the lead lining of the tank can be used, but it is better to hang in strips of lead about 6 in. wide and 3/16 in. thick; their length should be equal to the extreme length of the article to be stripped. The solution used should be prepared on the basis of 16 ozs. muriatic acid to each gallon of water. Possibly the addition of one or two ounces or more of hydrofluoric acid per gallon of water would prove beneficial.

It might be well to have some plating concern near you try out this method before you install a tank. It could be tried on a small scale at low cost. For your purpose you would require a generator of at least 6 volts and 1,000 amperes capacity.—C. H. P., Problem 3,800.

Snow Flake Finish on Brass

Q.—While looking through some special parts I had in stock, I came across a handle which I am sending you under separate cover which I think has a very beautiful finish. In my line of work we are called upon to furnish fixtures in various finishes such as nickel, chromium and gold. To my mind, if this design was plated on a fixture it would be very beautiful.

I am wondering if you could give me any data on this finish; whether it is a plating or acid dip process, and also what you think are the wearing qualities?

A.—This is known as the "Snow Flake," or Crystallized Brass, finish. It is produced on cast brass that contains small amounts of aluminum. It has been polished and buffed to a good lustre before treatment. In 1908 the writer published an article which outlined the production of this finish. You can obtain this by applying to the publisher The title is: "A Practical Solution for the Production of Crystallized Brass Finish." This appeared on page 54, issue of February, 1908. You can obtain a photostat copy of the page.

There is another method of producing this finish. This consists of cleansing the brass castings after finishing to a polished lustre as in your sample, then copper plating in a cyanide solution for a few minutes to obtain a uniform copper deposit. Then the articles should be placed in a copper sulphate solution which is prepared along usual lines—from 16 to 24 ozs. copper sulphate and 4 to 8 ozs. sulphuric acid to each gallon of water. Copper cathodes are used and the brass articles are placed in the tank as the anodes. The operation, in other words, is the reverse of copper plating, for the copper-plated articles are hung on the anode rod in the sulphate solution.

A current of 2 volts is applied. The copper deposit on the castings will reduce and in its place will be formed the "Snow Flake," or crystallized brass finish that is on your sample.

After the process is finished, the articles should be lacquered with fairly heavy gum nitro-cellulose lacquer to give the desired lustre.—C. H. P., Problem 3,801.

Tumbling and Burnishing

Q.—Please advise us of the best methods to use for tumbling sharp corners from forgings, and for burnishing the article to obtain a bright smooth finish. Low carbon, cold rolled steel is used. Also include information as to the best type of machine, together with any materials that are necessary.

A.—Prepare the following solution:

Water	1 gallon
Silica sand	25 lbs.
Pumice stone	25 lbs.
Trisodium phosphate	1 lb.
Sodium cyanide	1 lb.

The above are the appropriate proportions of sand and coarse pumice stone. You may vary the proportions if found desirable. An oblique tumbling barrel will probably suit your purpose best.

After the sharp corners have been removed from the forgings, wash them in cold water and retumble in the following solution, using steel balls to produce a lustre:

Water	1 gallon
Soda ash, 58%	3 ozs.
Sodium cyanide	1 oz.

The speed of rotation should be not less than 20 revolutions per minute. The first operation may take several hours, and the second should take a minimum of two hours. The time factors can be determined best under actual working conditions.—C. H. P., Problem 3,802.

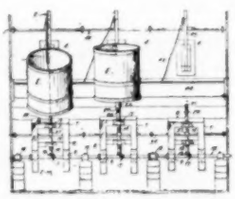
Patents

A REVIEW OF CURRENT PATENTS OF INTEREST

1,679,003. July 31, 1928. **Welding Rod.** Norman B. Pilling, Elizabeth, and John Geo. Schoener, Bayonne, N. J., assignors to The International Nickel Company, Inc., New York, N. Y.

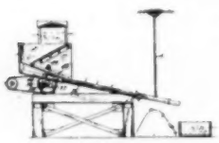
A welding electrode comprising a metallic nickelous matrix malleableized by an alkaline-earth metal, and an associated coating including a titanium alloy and a calcium alloy, titanium aggregating from 0.1 to 10 per cent, and calcium from 0.1 to 8 per cent of the weight of the electrode, respectively.

1,677,817. July 17, 1928. **Apparatus for Electroplating and the Like.** Joseph De Verre, Oakland, Calif.



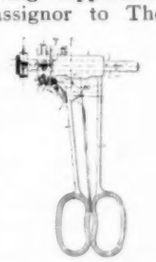
In an apparatus of the character described, a rotatable plurality of supports, containers adapted to be mounted on said supports for rotation therewith and arranged to have anode and cathode members associated therewith, means operable entirely by and upon a relative displacement of said containers and supports to connect them for or release them from rotative engagement, and means arranged to hold one of said members connected to a source of current during the rotation of its support.

1,679,385. August 7, 1928. **Apparatus for Reclaiming Metals.** Theron D. Stay and Charles O. Tessier, Cleveland, Ohio, assignors, by mesne assignments, to Aluminum Company of America, Pittsburgh, Pa.



Apparatus for use in the recovery of readily oxidizable metal from metal-containing dross, comprising in combination, means for reducing highly heated dross to a finely divided condition, thereby liberating molten metal entrapped therein, movable means for quickly agglomerating and then solidifying the molten metal so liberated, and means to actuate said movable means.

1,679,906. August 7, 1928. **Metal-Drawing Apparatus.** Delamar C. Kinnear, Waterbury, Conn., assignor to The American Brass Company, Waterbury, Conn.



In a device of the character described, the combination of a support, a slide movably mounted on said support and provided with a series of teeth, a clamp and a die, one mounted rigidly on said support and the other on said slide, a pawl engaging said slide, and means carried by said support for reciprocating said pawl so as to successively engage said teeth and move said die and clamp away from each other.

1,679,860-1,679,861-1,679,864-1,679,869-1,679,870. August 7, 1928. **A Mold for Casting Metals, and Method of Making Mold and Castings.** These patents are divided between Marius Guyot, George Kohl and Allen B. Norton, all of Cleveland, Ohio, assignors to the Aluminum Company of America, Pittsburgh, Pa.

They cover a number of different types of permanent molds for making aluminum castings, the method of constructing said molds and operating them to make permanent mold castings.

1,680,004. August 7, 1928. **Aluminum Alloy of High Resistance.** Henri Bénit, Paris, France.

A homogeneous and stable light aluminum alloy capable of being subjected to repeated melting without losing its characteristic properties, said alloy having substantially the following composition:—

2 parts by weight of copper,
0.37 parts by weight of nickel,
0.27 parts by weight of tungsten,
0.45 parts by weight of magnesium,
96.91 parts by weight of commercial aluminum,

with 2 to 0.5% impurities, cast test bars showing a tensile strength of 22 kgs. per square mm. with 6% expansion and test bars of the forged, stamped or rolled alloy showing a tensile strength of 30 kgs. per square mm. with 23% expansion.

1,680,262. August 7, 1928. **Light Metal Alloy.** John A. Gann, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

As a new product, an alloy containing not less than eighty nor more than ninety-nine and one-half per cent of magnesium, and not more than twenty nor less than one-half of one per cent of tin.

1,680,577. August 14, 1928. **Alloy.** Felix Visintainer, New York, N. Y.

An alloy consisting of the following ingredients in substantially the proportions specified: copper 85 to 89 per cent; aluminum 9 to 13 per cent; iron .25 to .65 per cent; silicon .30 to .70 per cent; tin .07 to .12 per cent.

1,680,598. August 14, 1928. **Alloy and Its Uses.** William Porter Dreaper, Hampstead Heath, England.

An alloy for use in the manufacture of jets for artificial silk filaments consisting of a mixture of gold and platinum, the latter metal being present in the proportion of from twenty-two to twenty-six per cent of the weight of the alloy produced.

1,680,045-1,680,046. August 7, 1928. **Method of Treating Copper Alloys and Improved Product.** Victor O. Homerberg, Belmont, Mass., and Dexter N. Shaw, Philadelphia, Pa.

Methods of treating copper alloys approximating 60-40 brass in such a way as to bring the tensile strength over 75,000 pounds per square inch and a Brinell hardness of over 200.

1,680,825. August 14, 1928. **Method of Pulverizing and Alloying Nickel.** William R. Veazey, Cleveland Heights, Ohio, assignor to The Dow Chemical Company, Midland, Mich.

In a method of the character described, the step which consists in heating together metallic nickel and magnesium at a temperature below the melting point of the former but above that of the latter until sufficient magnesium is absorbed by the nickel to render same readily pulverizable.

1,680,844. August 14, 1928. **Welding of Copper and Copper Alloys.** Frederick M. Becket, New York, N. Y., assignor to Electro Metallurgical Company, New York, N. Y.

A welding rod consisting predominantly of copper and silicon, the silicon being present in amount between 1.25 per cent and 4 per cent.

1,681,272. August 21, 1928. **Lead Alloy.** Hiroshi Yoshikawa, Tokyo, Japan.

An allow consisting of lead, bismuth and a metal immiscible with lead of the group: copper and nickel, wherein the bismuth content lies between 0.025 per cent and 4.0 per cent and the content of the metal immiscible with the lead lies between 0.025 per cent and 5.0 per cent.

1,681,509. August 21, 1928. **Cadmium Plating.** Leon R. Westbrook, Cleveland, Ohio, assignor to The Grasselli Chemical Company, Cleveland, Ohio.

A cadmium plating composition comprising about 50 parts of cadmium hydroxide, about 0.18 part of nickel as a compound of nickel which is soluble in an aqueous alkali metal cyanide solution, about 38 parts of sodium sulfate and about 11.5 parts of gulac.

1,681,521. August 21, 1928. **Process of Cleaning and Burnishing Metallic Powders.** John A. Daly, New Rochelle, N. Y.

The process of burnishing metals in a state of fine subdivision which comprises commingling the particles of metal with harder finely divided material and agitating the commingled substance.

1,682,157. August 28, 1928. **Method of and Means for Polishing Metal Surfaces.** William L. Weber, Chicago, Ill.

The method of polishing and hardening the contact surface of a commutator which consists in causing the surface to be treated to travel at a high speed, and applying against said traveling surface a composition of sulphur and an abrasive material under sufficient pressure and heat to polish said surface and cause the sulphur of said composition to unite with the metal of said surface whereby a hardened exterior is formed.

Equipment

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

The Use of Silver Solders

Having carried on extensive research on the subject for some time, Handy & Harmon, 57 William Street, New York City, manufacturers of precious metals, solders, anodes, etc., have issued two important sets of data on the use of silver solders. "The Handy Book of Silver Solder" is a 20-page booklet giving comprehensive data on the selection of silver solders. It is a brief review of the research that has been done and in it the standard

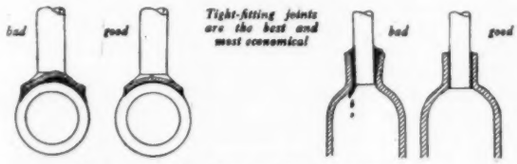


FIG. 1—GOOD AND BAD JOINTS

solders are described. Another pamphlet, "How to Use 'Handy' Silver Solders," gives highly useful information on methods of silver soldering. We quote from this paper as follows:

In soldering, parts must be clean; dirt should be removed either chemically or mechanically. Edges of joints should be smooth and tight fitting; only a film of solder is needed to give a strong, sound joint; it is wasteful to use it as a filler.

Proper fluxing is important. For general soldering use borax in a hot saturated solution, in a paste or in powder. For stainless steel or other metals forming oxides hard to remove, use a paste of boracic acid and borax with zinc chloride. (See "Hints" for information about preparing flux.) Use plenty of flux. Cover

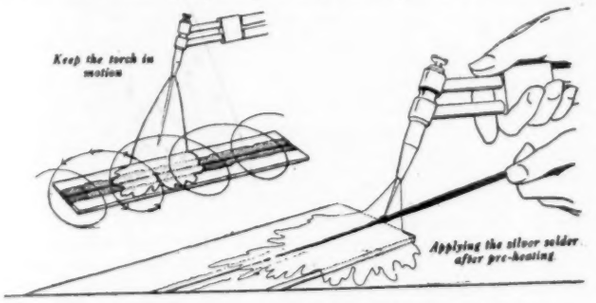


FIG. 2—HOW TO APPLY THE FLAME PROPERLY

all of the joint and the solder itself. This is to protect the parts against oxidization, to absorb oxides formed while soldering and to aid the flow of the solder. Brushing tends to spread the flux more evenly than dipping.

Slowly heat the joint and surrounding metal before soldering. Regulate the torch to a soft flame at the start so that the flux will not be blown off. Pre-heating adjoining parts limits heat radiation away from the joint itself. Give special attention to copper, for this metal is a rapid conductor.

When the joint shows a dull red, concentrate the flame at full pressure along the joint, judging the temperature by color, as follows:

First visible red is about 900° F.; dull red is about 1,200° F.; cherry red is about 1,400° F.; bright cherry red 1,600° F.

"Handy" silver solders melt at from 1,325° to 1,600° Fahrenheit. At the melting point of the silver solder bring the solder under the torch flame. Then, if the parts have been properly cleaned, fitted, fluxed and heated, "Handy" silver solders will flow along the joint, following the flux as though mechanically pushed. Stainless steel must be heated to about 1,550° before "SS" silver solder will join with the steel, even though "SS" melts at 1,435°.

HINTS ON SOLDERING

If expertly handled, an oxy-acetylene torch is usualy best. The flame is intense, however, and must be kept in motion. For delicate parts an oxygen-and-gas or gas-and-air torch will give good results. Either of these can be used on big parts, too. The operation will take longer in the pre-heating, but there will be less danger of melting the parts.

Powdered borax can be used without any preparation, but the following forms are more satisfactory in most instances:

1. Dissolved in hot water to make a saturated solution. Keep

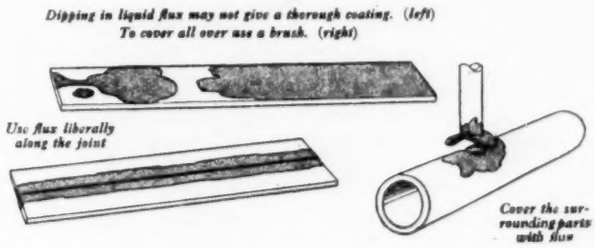


FIG. 3—APPLICATION OF FLUX

the solution hot while using. By this means the borax is deposited evenly.

2. Mixed with water to make a thick paste.

3. Fused borax mixed with alcohol. This must be kept in a closed container to prevent evaporation.

Borax becomes fluid at about 1,400° F. This is a good temperature guide. If there is a tendency of the flux to run off the joint during the soldering, add from 1/10 to ½ boracic acid to the borax. This makes the flux thicker and gummy but raises the melting point somewhat.

For stainless steels and other metals forming oxides hard to remove, use a paste, 1 part borax, 1 part boracic acid with zinc chloride solution.

Large surfaces should be pre-heated well away from the joint. This is particularly true of copper.

In pre-heating, favor the metal that is the more rapid conductor of heat, when joining different kinds of metals. Be sure to thoroughly pre-heat the heavier piece when joining different thicknesses of metals. Color is the guide to temperature in soldering, therefore, light conditions should not be allowed to affect the operator's judgment of color. Do not face the light. We recommend that the work be shielded by asbestos to shut off light and drafts of

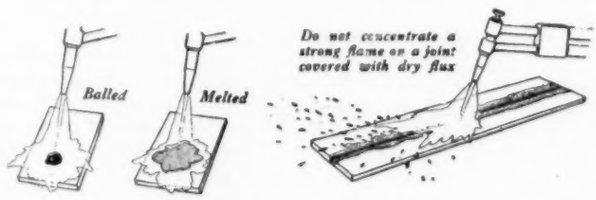


FIG. 4—HANDLING THE TORCH. AT LEFT IS SHOWN THE SOLDER "BALLED" DUE TO LACK OF FLUX OR INSUFFICIENT HEAT

air. Drafts of cold air cause uneven heating by cooling one part more than another. Reasonable speed is desirable. Pinholes in the finished joint may be caused by too much or not enough heat, or by dirt, oil or improper fluxing. Balling or bunching usually indicates improper fluxing or may be due to underheating.

Handy & Harmon state that their silver solders are made in the following forms: "DE," an easy solder, melting at 1,370° F.; "NT," medium, melting at 1,450° F.; "NE," hard, melting at 1,575° F.; "ATT," melting at 1,500° F., for seams and general

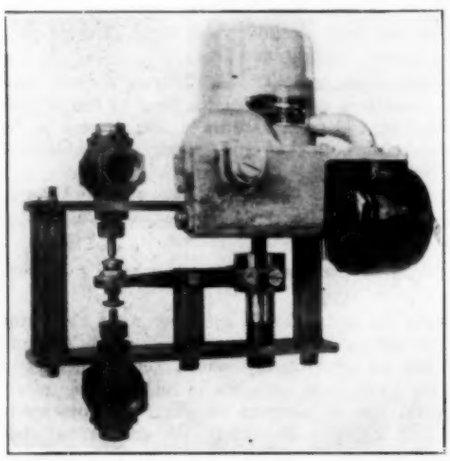
soldering and for use with "DE" as a second solder; "TL," for copper parts; "RT," for copper, has higher percentage of silver than "TL," flows at lower temperature and gives very strong joints; "DE" and "ET," for splicing copper wire and cable; "IT," for splicing wire to be redrawn, contains highest percentage of silver of all the "Handy" solders, making strong, ductile joints; "TL" and "ATT" are recommended for brass work; "DT," "ET" or "RT" can be used for Monel metal or nickel, the latter two having color approximating those metals, and "DT" being used where color is not important. "TL," while brassy in color, is suitable for joining stainless steels; "SS" can be used for stainless if the color needs to be matched, but it requires a higher temperature (1.550° F.); "TL" or "ATT" can be used for iron; "DE" is suitable for steel. Handy & Harmon make solders in sheets of 20 B. and S. gauge, any width, in rolls; in strip, 20 B. and S. gauge, ⅛ in. wide, 20 in. lengths, .003 or .004 in. thick, and also in ½ in., ⅝ in., or ¾ in. widths; in wire, 1/16 in. diameter and 18 B. and S. gauge; in fillings, 40, 60, 80, 100 or 150 mesh. These sizes and shapes, the makers state, cover most operations, but special sizes and shapes to meet all requirements can be supplied on order.

Standard materials are delivered from stock, usually within a few days, it is stated. Booklets on the subject may be had gratis on application to Handy & Harmon, 57 William Street, New York City.

Motor Valve for Chromium Plating

A new equipment for controlling the temperature of chromium plating tanks is offered by the St. Louis Motor Valve Company of St. Louis, Mo.

The device, which is shown in the illustration is electrically operated and may be installed with ease. A special totally-inclosed, reversible motor of General Electric manufacture drives a threaded shaft through a double worm reduction gear mechanism. A lever, connected to this shaft and pivoted in its center, is arranged to operate two valves alternately, one for steam and one for water. A limit switch, at the top of the cast aluminum housing, stops the motor at proper positions.



MOTOR VALVE FOR CHROMIUM TANKS

The complete control consists of a contact-making thermometer, either of the recording or indicating type; a relay panel, and the duplex valve unit. The thermometer, which may be of any standard make, contains two contact points by means of which one circuit is made when the temperature is low, another when the temperature is high and none when the temperature is correct. The relay panel, which consists of two small contractors with series resistances, is operated by the instrument contacts. By the use of this relay the instrument contacts carry only a very small current and do not break an inductive circuit. Another purpose of the relay panel is to provide an electric circuit to the motor at the neutral position of the instrument.

Life tests in the laboratory and extensive tests in the field have proved this device to be both accurate and dependable in providing automatic temperature control where alternate heating and cooling is required, the makers state. Many of the temperature charts which have been obtained show a temperature variation of less than ½ degree on either side of the correct setting; an accuracy of better than 1%. Since one power unit controls both valves, the device is compact. It is electrically operated and self-contained, making it easily installed and applicable wherever electric power is available. Since the unit has many times the power necessary to operate the valves, long life with a minimum of maintenance cost is assured, it is claimed by the maker.

Other advantages claimed for this device are adjustable minimum and maximum settings of either valve, the impossibility of accidental opening of both valves at the same time (a distinct advantage where only one pipe coil is used in the tank) and the use of the best possible materials throughout.

Hand-Operated Spray-Painting Outfit

The increasing demand for a low-priced spray-painting outfit that will include dependable efficiency and assure satisfactory results in the hands of an untrained user inspired The DeVilbiss Company, Toledo, Ohio, to have its engineering organization consider the problem.

The result of this is the new DeVilbiss Type TZ spray-painting outfit which is designed for all trade groups having painting problems, as well as the public generally. The DeVilbiss Company claims that its new outfit is as carefully designed and built and as advanced in its field as the big capacity DeVilbiss outfits which are used in automobile plants, furniture factories, and all industries where spray-finishing is an established production process. The objective of the company was to embody in a low-priced, hand operated spraying unit all the knowledge and experience of the DeVilbiss organization, which is old in the business of originating and manufacturing such equipment. The outfit successfully handles all the modern lacquers as well as paints, varnishes, enamels, stains, shellacs and bronzes, and it enables anyone to take full advantage of the almost limitless opportunity afforded today for decoration, preservation and renewal of all household, store, office and factory equipment and products, the makers state.

HAND SPRAY OUTFIT

The combination hand-pump and air reservoir, as shown in the illustration, operates easily with one hand, storing up air pressure in the reservoir and providing a steady, uniform flow of air through the gun. The glass container for material is easily attached and detached. The gun is under perfect control at all times, and, being simple and durable in construction, is quickly and easily cleaned, it is claimed. The outfit can be satisfactorily used for coating or touching up automobiles, reed, willow and fibre furniture and other articles, refrigerators, wood and metal furniture of all kinds, woodwork, radiators, fixtures and other metal articles, for spraying moth-proofing solutions on upholstered furniture and clothing, and insecticides on shrubbery and flowers, and for various other purposes in home, store or factory.

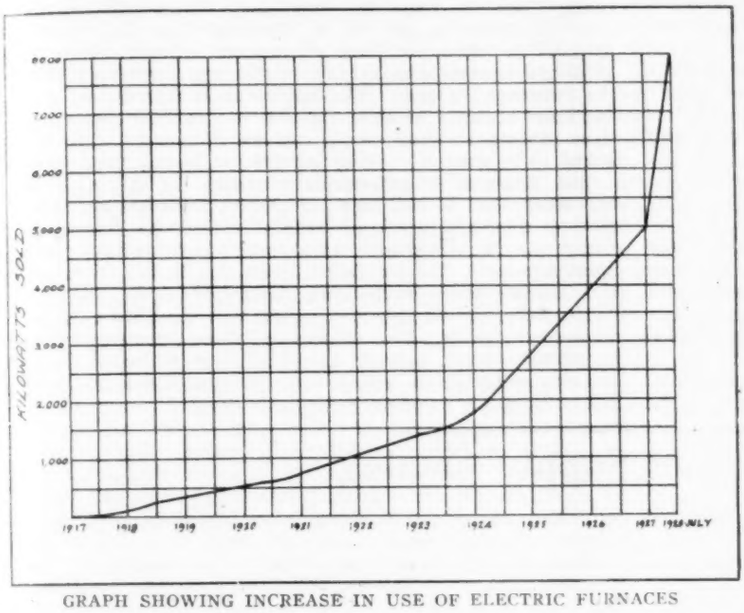
For convenience, various kinds and colors of materials may be kept in extra glass containers, with covers, ready for instant use. The DeVilbiss gun is so designed that ordinary pint-size fruit jars with screw tops may conveniently be used for this purpose.

Brighteners for Plating Solutions

The E. Wambaugh Company, Goshen, Ind., has placed on the market a line of brightening agents for plating solutions. These brighteners, sold under the trade names of "Nickel-Brite," "Copper-Brite," "Brass-Brite," etc., are intended for use with all standard nickel, copper, bronze, brass, cyanide zinc and cadmium solutions, and it is claimed that their use in small quantities produces lustrous finishes and tends to eliminate the need of coloring after electroplating. The brightener, which is sold by the gallon in liquid form, is mixed with the solution and needs replenishing only when the deposit is seen to be losing lustre.

Large Gain in Use of Electric Furnaces

There has been a steady and notable increase in use of electric furnaces for melting metals during the past few years. In the first half of the current year there was an especially rapid gain, the curve of sales of one of the leading makers of electric furnaces reflecting this increased use. This company, the Ajax Electrothermic Corporation, Trenton, N. J., has prepared a graphic chart showing the curve of its sales since 1917, and has also supplied a list of the installations made and ordered thus far this year. This company makes the Ajax-Northrup high frequency furnace and is a division of the Ajax Metal Company, Philadelphia, makers of the well known Ajax-Wyatt electric furnace and also producers of various metals and alloys.



GRAPH SHOWING INCREASE IN USE OF ELECTRIC FURNACES

The company states that measuring sales in terms of kilowatts, that is, the sizes of the furnaces, it is seen that the company's sales during the first half of 1928 reached some 8,000 kilowatts, whereas in the best previous year, 1927, sales reached only 5,000 for the full twelve months. This means that, provided the sales continue steadily during the balance of 1928, the present year will show total sales of perhaps 15,000 or 16,000 kilowatts, or three times as high as in 1927. The curve which starts with 1917, shows that there has been a steady increase each year, the greatest advances having been made since 1923.

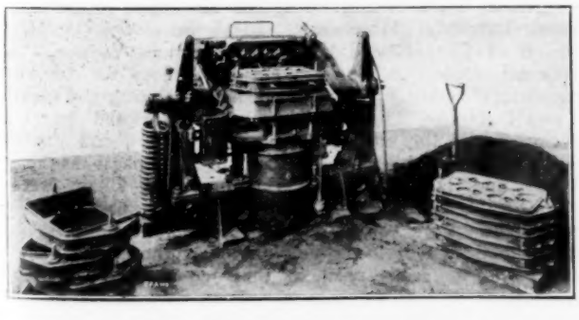
The Ajax company has appended to its statement a list of installations made and ordered thus far in 1928, as follows:

FIRM	KW.
American Rolling Mill Company	20
Hoskins Manufacturing Company	150
Heppenstall Forge and Knife Company	150
Allen Everitt Sons, England	100
Henry Wiggins and Company, England	150
Arthur Balfour Company, England	150
Telegraph Construction and Maintenance Company, Ltd., England	150
MM. S. A. de Commentry-Fourchambault and Decazeville, France	150
Jacob Holtzer Company, France	150
Compagnie Francaise de Metaux, France	100
Watertown Arsenal	150
General Fire Extinguisher Company	100
Stahlwerk Hoesch, Dortmund, Germany	330
Fereinigen - Stahlwerk - Bochumer - Verein, Germany	300
Stahlwerke-Becker, Dusseldorf, Germany	300
I. G. Farbenindustrie, Ludwigsshafen, Germany	45
Russische Handelsvertretung, Germany	45
Metallwerke AG. Dornach, Switzerland	100
Dr. Alexander Wacker, AG., Werk, Tschechnitz, Germany	35
Technical High School, Charlottenburg, Germany	16
8 miscellaneous, 6 kw. lab. furnaces in Germany.	

	KV.-A
National Tube Company	35
Western Electric Company	35
U. S. Assay Office	35
American Car and Foundry Company	35
Carnegie Steel Co.	35
Yale University	35
Wm. Grant	35
The Duriron Co.	35
Rensselaer Polytechnic Institute	35
Robert D. Pike	35
Carnegie Inst. of Technology	35
Vanadium Alloys Steel Company	35
Standard Telegraph and Cables, Ltd., England	15
Lehigh University	15
General Electric Company	3
Electric Furnace Company, England	3
University of Illinois	3
Virginia Polytechnic Institute	3
University of Saskatchewan, Canada	3
U. S. Bureau of Mines, Tucson, Ariz.	3
U. S. Bureau of Standards, Washington, D. C.	3

Multiple Molding Machine

The Tabor Manufacturing Company, 6225 Tacony Street, Philadelphia, Pa., makers of core and molding machines, as well as other foundry equipment, has placed on the market a new development in automatic molding machinery, known as the Multiple Molding Machine. This equipment is stated to be thoroughly modern in design, highly efficient in performance, rapid in operation, and, withal, extremely simple in construction. The illustration shows a multiple molding machine which has been fitted with patterns for pipe fittings. The machine is said to be particularly useful in molding for this class of work, as well as for similar small work of other kinds.



MULTIPLE MOLDING MACHINE

The machine is equipped with two sets of half patterns, according to the description. Half is on the lower pattern plate and the other half on the pattern plate which attached to the squeezing head of the machine. The upper part, or squeezing head, lifts up and swings into place directly over the lower plate. The operation is said to be very smooth, the parts being well guided. All necessary adjustments to take up for wear from time to time can be readily made. The pattern draw and vibrator are automatic. The specially designed head makes it possible to clean the upper pattern as well as the lower one with ease.

New Type of Plug Fuse

The Trico Manufacturing Company, Milwaukee, Wis., makers of "Trico" renewable fuses, have placed on the market an innovation in plug fuses. This is the idea of coloring fuses according to amperage so that their capacities are easily recognized without reference to the tiny figures stamped on the fuses heretofore. The company has adopted the following colors: Brown for 0 to 6 ampere fuses; yellow, 10 ampere, blue, 15 ampere; pink, 20 ampere; red, 25 ampere; green, 30 ampere. It is believed that this means of making the capacities of fuses visible will be highly usful to dealers, contractors, utility men and inspectors. Housewives will be enabled to remember more easily what capacity fuses they need, as colors are easier to remember than numbers. The packing of these fuses has been altered also, there being a peephole in each five-unit carton, through which the color of the fuses contained may be seen, so that capacities are easily recognized from a distance.

Gas Burner with Thermostat

A new type of gas burner, controlled by a thermostat, has been designed and placed on the market by the Johnson Gas Appliance Company, Cedar Rapids, Iowa, manufacturers of gas appliances, torches, furnaces, etc. The new burner, which is particularly suited to use with coffee urns or steam tables, is so designed as to prevent overheating of liquids in the urns, tables, etc., and to keep down the consumption of gas. Coffee is thus prevented from boiling and there is a saving in gas since the thermostat keeps the burner flame properly adjusted. Both the burner and the thermostatic control are new in design and application, the company states. The device is set to keep up a certain temperature, thereafter requiring no attention until there is necessity to change the temperature at which a food is to be kept.

Test Set for Pickling Solutions

A new type of material for testing the efficiency of pickling solutions has been placed on the market by the Research Manufacturing Company, Dept. M., Oak Lane, Philadelphia. Pa. The outfit is known as the "H. K. Chemical Test Set," and it is designed to show the user of pickling solutions when more pickling compound is needed in a solution and also when to discard the contents of a tank. The makers claim that the set greatly facilitates economy of acids and aids in producing better results than haphazard or inaccurate methods of control. The set is stated to be good for testing any type of acid pickling solution.

The Research Manufacturing Company at the same time announces that it has been made sole distributor for a new pickling compound developed by E. I. duPont de Nemours and Company. The substance is stated to be a highly efficient pickling agent for steel. The distributors claim that it will remove scale and then stop acting on the steel, thus conserving the acid content of the pickle as well as protecting the steel from undue corrosion while in the pickle. This property is insured by the inclusion of an inhibitor which prevents over-pickling or pitting of the steel and also suppresses the flow of hydrogen gas. The latter property makes the pickle free from fumes, it is stated.

Equipment and Supply Catalogs

Oakite for Cleaning Metals. Oakite Products, Inc., 22 Thames treet, New York City.

Bad Air Is Bad Business. American Blower Corporation, Detroit, Mich. Ventillating apparatus.

Triple-E Composition. E. Reed Burns and Sons, Inc., 21 Jackson Avenue, Brooklyn, N. Y. Polishing supplies.

Character and Uses of Norton Products. Norton Company, Worcester, Mass. Very interesting illustrated booklet.

Duriron Valves and Standard Pipe. The Duriron Company, Inc., Dayton, Ohio. Bulletin 148, on valves, fittings, etc.

Rolled Anodes. Taunton-New Bedford Copper Company, Taunton, Mass. Pamphlet on "Eagle Brand" copper anodes.

A Better Kind of Sheet Copper. The New Haven Copper Company, Seymour, Conn. Leaflet on the "Rold Cold" brand of sheet copper.

Long Distance Transmitting and Recording System. The Bristol Company, Waterbury, Conn. Miscellaneous long distance recording apparatus.

Progress in Nickel Plating. W. Canning and Company, Ltd., Great Hampton Street, Birmingham, England. Equipment for warm nickel plating. An interesting booklet.

What It Means. Roller-Smith Company, 231 Broadway, New York City. Leaflet sent with blotter on which company's Chinese monogram (used in Chinese trade) appears.

The Nichols-Lintern Company, 7960 Lorain Avenue, Cleveland, Ohio. Catalog of N-L Universal signal lanterns, lantern flasher controls and reflector units, electro-magnetic sanders for overhead cranes, etc.

Saw Sharpening and Knife Grinding. Norton Company, Worcester, Mass. Booklet on sharpening and grinding knives in southern saw mills. Also, a similar booklet on same work in western mills.

Automatic Controllers. The Foxboro Company, Inc., Foxboro, Mass. Bulletin 112-2; 68 pages; fine illustrations and descriptive matter on automatic temperature, humidity, pressure, flow, etc., controllers.

HB Shop Equipment. Hobart Brothers Company, Troy, Ohio. Battery chargers, electrical testing equipment, automatic air service, spray painting devices, car washers, buffers and grinders and other products.

Students' Kelvin Bridge. Leeds and Northrup Company, Philadelphia, Pa. Booklet describing the Kelvin Bridge method of measuring low electrical resistances accurately, which is extensively used by students.

Baird Automatic Machines. The Baird Machine Company, Bridgeport, Conn. Pamphlet on automatic equipment for tumbling, wire and ribbon metal forming, spring making, and power presses, chucking machines, etc.

Crucibles, Their Care and Use. The Naugatuck Valley Crucible Company, Shelton, Conn. A very fine pamphlet in the shape of a crucible. Gives descriptions of the company's products, with dimensions of all standard sizes of crucibles.

How the Other Fellow Does It. The Brown Instrument Company, Philadelphia, Pa. Broadside on temperature control apparatus for gas-fired annealing, hardening, normalizing, tempering, calorizing, galvanizing, sherardizing and other heat processes.

Merchants' Association Year Book—1928. The Merchants' Association of New York, Woolworth Building, New York City. A 335-page book giving names of executives of the Association, committees, reports on various activities, by-laws, and a valuable classified directory of members, etc. Excellent publication, well designed and printed.

General Electric Company, Schenectady, N. Y. New publications: Pressure and Vacuum switches; High-torque Double Squirrel-cage Motors; Woundrotor Induction Motors, "900 Series"; General-purpose Synchronous Motors; Automatic Welding Head and Control; Electric Heat in General Electric Factories (32 pages); Silent Gears (32 pages); Crane and Hoist Motors.

The Use of Research in Standardization and Simplification. Policyholders Service Bureau, Metropolitan Life Insurance Company, New York City. No. 2 of a series of reports on applying research to production. Part of a study of business through research in New England Industry, prepared for the research committee of the New England Council. No. 5, on **Research in Sales Management,** has also been prepared.

Ideal Industrial Machinery. Ideal Industrial Machinery Division of Consolidated C. M. Corporation, Winton Place, Cincinnati, Ohio. A fine catalog of devices for tumbling, separating, cleaning, washing, burnishing, painting and pickling of metal parts. Thirty-one beautifully printed pages of descriptions of the company's products and a full explanation of the service the company offers to users of its machinery.

Wasp and Hornet Aircraft Engines and Their Use of Nickel Steels. The International Nickel Company, 67 Wall Street, New York City. A 12-page booklet on essential features of design of these well-known engines, and a discussion of the materials used in their construction. General specifications of both engines are given, with power and fuel consumption charts and photographs of numerous typical installations in military, naval and commercial service.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILL.

Following the resignation of B. D. Fuller as chairman of the American Foundrymen's Association's Committee on Molding Sand Research, Fred Erb, of the Erb-Joyce Foundry Company of Detroit and vice-president of the A. F. A., has been appointed general chairman of the committee. Mr. Fuller retains his interest in the committee's activities and remains on the executive committee. A new position, that of technical director, has been created in the committee's organization and Dr. H. Ries, head of the department of geology, Cornell University, has been selected to fill the position. Dr. Ries has been connected with the work of the committee since its inauguration in 1921, first as chairman of the sub-committee on Geological Survey of Foundry Sand Resources and later as chairman of the sub-committee on tests. One of the most eminent of economic geologists of the country and an authority on clays, Dr. Ries was a pioneer in investigating foundry sands. His work in 1904 and '05 on the surveys of the foundry sand resources of Michigan and Wisconsin was perhaps the earliest systematic investigation of foundry sands. For his earlier work in connection with the committee in its development of sand testing methods, honorary membership in the American Foundrymen's Association was conferred upon Dr. Ries.

The Committee on Molding Sand Research, organized in 1921 as a joint committee of the A. F. A. and of the Engineering Division of the National Research Council, under the chairmanship of Mr. Fuller, recently issued its second volume of Standard and Tentatively Adopted Methods of Testing and Grading Foundry Sands. The work of the committee as a whole has been of great value to foundrymen in placing foundry sands under technical control. Its future work will be to simplify test methods, carry on research projects, and formulate sand grading classifications.

1929 CONVENTION

At the recent meeting of the board of directors several alternative plans for the 1929 convention were discussed. These included a strictly technical session such as was held in Chicago in 1927 and the usual large convention and exhibit such as was held in Philadelphia in 1928. All received consideration, after which the board unanimously adopted a program which provided for the holding of a three-day technical session such as was held at the Edgewater Beach Hotel in '27 and to add to the interest and value of the meeting by providing for an exhibit limited as to area and to some extent as to the character of operating exhibits. The board was also unanimous in favor of holding this meeting and exhibit in Chicago at the new Stevens Hotel.

In view of the fact that the Third International Foundry Congress will be held in London the week of June 11th and that the first sailing date for the American delegation will be May 11, it was decided to hold the convention earlier than usual, and the week of April 8 was chosen.

Monday, April 8, will be devoted to committee meetings and registration. The exhibit will open at 10.00 A. M. Monday and 9:00 A. M. Tuesday, Wednesday, and Thursday; closing each day at 5:00 P. M. The opening convention session will be Tuesday A. M. and the closing session Thursday P. M.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

CONVENTION DATES ARRANGED

The committee of the Detroit Branch appointed to take charge of the 1929 annual convention of the Society, which is to be held in that city, has arranged the following dates for the event: July 9 to 11, inclusive. It will be held at the Hotel Statler, Detroit, Mich. Details will be found under the Detroit Branch news below.

Bridgeport Branch

HEADQUARTERS, CARE OF WILLIAM EHRENCRONA, 872 HANCOCK AVENUE, BRIDGEPORT, CONN.

The members of the Bridgeport Branch of the American Electroplaters' Society will enjoy a special function to be known as "Old Timers'" night on November 16. At the same meeting there will be instituted an innovation, which is to be called "question box night." There is to be no talk on any specific subject, but discussion will be confined to problems presented by the members and their friends in the plating industry. George B. Hogaboom, well known plating expert, will be present and will endeavor to aid the platers in solving whatever problems they choose to place before him for consideration. All members and friends of the Branch who wish to partake in this meeting are urged to attend. The meeting will be held at Room 17, No. 62 Cannon street, Bridgeport.

Detroit Branch

HEADQUARTERS, CARE OF CHARLES PHILLIPS, 13421 CAMDEN AVENUE, DETROIT, MICH.

The general committee of the Detroit Branch which is in charge of the arrangements for the next annual convention of the American Electroplaters' Society, to be held at Detroit in 1929, have settled the dates for the convention, it is announced by T. C. Echstardt, chairman of the committee. The event is to take place on July 8, 9, 10 and 11, 1929, at the Hotel Statler, Detroit. T. C. Echstardt, who has been appointed chairman of the General Reception, Information and Registration Committee, may be addressed at 654 Mount Elliot Street, Detroit, Mich. The Executive Committee is headed by E. G. Lovering.

REGULAR BRANCH MEETING

The regular branch meeting was held at the Hotel Statler, Detroit, on Friday evening, November 2. Dr. William Blum, of the Bureau of Standards, Washington, D. C., gave a talk on electroplating.

The meetings of the Detroit Branch are held regularly on first Friday of each month, at 8 p. m., on the ballroom floor of the Hotel Statler, Detroit.

St. Louis Branch

HEADQUARTERS, CARE OF C. P. McGINLEY, 5312 WEST FLORRISANT AVENUE, ST. LOUIS, MO.

MEETING PLACE CHANGED

The St. Louis Branch has changed its meeting place from the Barr Branch Library to the Central Y. M. C. A. The meetings will be held on the second Friday of the month, as previously. The Central Y. M. C. A. is located on 16th and Locust Street, St. Louis. —CHARLES T. McGINLEY, Secretary.

Rochester Branch

HEADQUARTERS, CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE ROCHESTER, N. Y.

The Rochester Branch held an open meeting on Friday evening, September 21, at Powers Hotel. About 150 men interested in electroplating attended, and heard Horace H. Smith, Supreme President of the Society, address the meeting. He declared that the members of the Society benefited greatly by the educational and fraternal activities of the various branches. Oliver J. Sizelove, of Newark, N. J., gave a very instructive talk on a subject in which all platers are taking great interest, Chromium Plating. The meeting was in charge of Clarence Reama, President of the Branch, who introduced the speakers and led the discussion.

There was a family outing and clam bake on Saturday, September 22, which was attended by all the members and by Messrs.

Smith and Sizelove, who were guests of honor. This took place at the Rochester Rifle Range, near this city. Among the day's sports was a ball game between President Reama's "Red Wings" and Vice-president Hart's "Stainless Steel Specials." The playing of Messrs. Wolf and Lopez of the Red Wings, and of Messrs. Hart and Elster of the opposing team, was especially distinguished. H. A. Todd made a very satisfactory umpire. At the end of the eleventh inning the game was called, with the score tied at 3-3. A feature of the clam bake dinner was a clam eating contest, which was won by A. Neubeck, who finished with a surprising pile of empty clam shells before him. After the outing the members joined in bidding farewell to Messrs. Smith and Sizelove, whose presence was enjoyed by all.

CHARLES GRIFFIN, Secretary.

Waste Material Dealers' Association

HEADQUARTERS, 1100 TIMES BUILDING, NEW YORK CITY

The Metal Division of the National Association of Waste Material Dealers met on October 17 at the Hotel Astor as a part of a series of fall meetings of the association as a whole. The Metal Division devoted the major part of its meeting to a discussion of the meaning of certain terms which are common in the scrap trade. The discussion was initiated by T. A. Wright, secretary and chief of the technical department of Lucius Pitkin, Inc., New York City, who had addressed a letter to the Division inquiring as to the meanings of such terms as "metallic content," "total metallics," "metallic yield," "wet assay," etc., as applied to scrap battery plates. Mr. Wright supplemented his letter by appearing at the meeting, where he stated that to the chemist these terms were confusing as used by the scrap trade, due largely to the fact that they are used interchangeably by many dealers, brokers and consumers, while to the chemist they are separate terms, each with its own meaning. At the suggestion of some of the members present, the matter was referred to a committee which will be appointed and of which Mr. Wright will be a member. It was the general opinion that terms such as these, which are steadily used in contracts, should be defined.

Other matters discussed were insurance liability on export shipments and validity of verbal contracts.

The general meeting of the association was held in the afternoon. The secretary reported increased membership, due to the applications of some thirty large manufacturing concerns, including E. I. du Pont de Nemours, General Electric Company, U. S. Steel Corporation, Western Electric Company and many others of importance. These companies have decided, the secretary said, to join the association in order to be upon equal footing with the rest of the members, with many of whom those firms do business.

The next annual meeting and banquet of the association will be held at Chicago in March, 1929.

Copper and Brass Research Association

HEADQUARTERS, 25 BROADWAY, NEW YORK CITY

The eighth annual meeting of the Copper and Brass Research Association was held on October 25 at the association's offices. R. L. Agassiz, chairman of the Calumet and Hecla Consolidated Copper Company, was re-elected president. The other officers elected are: Vice-presidents, F. S. Chase, Walter Douglas, Barton Haselton, Thomas D. Brophy; treasurer, Stephen Birch; manager, William A. Willis, who has had that office since the association's formation; secretary, John F. Cowan. Among the directors are: John A. Coe, president of the American Brass Company; F. S. Chase, president, Chase Brass and Copper Company; Barton Haselton, Rome Brass and Copper Company; F. J. Bassett, sales manager, Taunton-New Bedford Copper Company; W. R. Webster, vice-president, Bridgeport Brass Company; B. Goldsmith, president, The National Brass and Copper Company; E. O. Goss, president, Scovill Manufacturing Company.

Besides those named in connection with directors, the following fabricators are among the members of the association; T. E. Conklin Brass and Copper Company, Dallas Brass and Copper Company, New England Brass Company, Mueller Company, New Haven Copper Company, New Jersey Wire Cloth Company, Paper and Textile Machinery Company, J. M. and L. A. Osborn Company, Foster Wheeler Corporation, Wolverine Tube Company.

Association of Arts and Industries

HEADQUARTERS, 230 EAST OHIO STREET, CHICAGO, ILL.

An exposition of modern American industrial and decorative arts—the first of its kind ever held—will take place in Chicago in January. Planned on a large scale, it will embrace decorative work in practically every material used in the construction and furnishing of the modern home: furniture, textiles, ceramics, glass, metalwork, lamps and lighting fixtures, leather, cement products and stone, rugs, silverware and jewelry, all created by noted designers for leading American manufacturers.

The exposition, under the auspices of the Association of Arts and Industries of Chicago, will be held in Mandel Brothers' department store, Chicago, Ill., where it will occupy one whole floor.

Personals

Wallace G. Imhoff

Wallace G. Imhoff, formerly metallurgist of the Electrical Materials Department of Hubbard & Company, Pittsburgh, Pa., has opened an office at 401 Highland Building, Pittsburgh, Pa., as a consulting metallurgical engineer in pickling and galvanizing. Mr. Imhoff's practical experience in the galvanizing field dates back over a period of fifteen years to the time when he started in the galvanizing department of the American Steel and Wire Company at Rankin, Pa.

Mr. Imhoff received his technical training at the Carnegie Institute of Technology, Pittsburgh, earning the degrees of B. S. and Met. E., in metallurgical engineering from that institution. He later studied under other prominent geologists and metallurgists at the University of Wisconsin, Harvard University, and the University of Pittsburgh, receiving the degrees of B. A. and M. S., in geology and metallurgical engineering.

Very few men are so fortunate in gaining practical experience in iron and steel, and in general metallurgy. After traveling extensively all over the famous western mining districts, including Cripple Creek, Leadville, Old Virginia City, Montana, Butte and the Juneau District, Alaska, Mr. Imhoff returned to the east and spent the next couple of years diamond drilling, exploring and developing iron ore properties in the Lake Superior district.

In the following years he became actively engaged in practical operation of blast, basic open hearth and electric furnaces. After sixteen months as a Lieutenant in the Air Service, Mr. Imhoff again resumed his work in the steel business as assistant to the general superintendent of an eastern steel plant. In 1920 he resigned to become the research engineer for The Sheet Metal Ware Association of New York and Buffalo, investigating the field of hot galvanizing for fifteen large steel companies. This work was carried on over a period of five years at the Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa. The investigations included all the troubles that the practical galvanizer is likely to encounter, as well as improved methods in galvanizing. A number of patents were taken out, including

WALLACE G. IMHOFF

one of the field of electric galvanizing, and he also developed the Imhoff "Pickle Tablets" for making a quick practical analysis of the pickling solutions used in galvanizing.

Mr. Imhoff is considered an authority on the process of hot galvanizing. He has written many technical articles on the practical phases of iron and steel, and has recently covered in detail the field of pickling. For the past year Mr. Imhoff has been the metallurgist of Hubbard & Company, Pittsburgh, Pa., in the electrical materials department, the product being galvanized pole-line hardware for the power industry.

John C. Oberender

John C. Oberender, manager of the New England division of The Zapon Company of New Haven, Conn., one of the best known men in the metal finishers' supply business, and his wife, who is also well known to platers and finishers, will celebrate their Silver Wedding on November 25, 1928, when they will have completed twenty-five years of an extremely happy married life.

JOHN C. OBERENDER

Mr. Oberender started his business career as a finisher in the polishing department of the Eberhard Faber Pencil Company, Brooklyn, N. Y. After some time in that capacity he was promoted to the position of head of the lacquering and finishing departments. In 1913 Mr. Oberender went to New Britain, Conn., where he joined the P. and F. Corbin Division of the American Hardware Corporation. Here he was at first made foreman of the lacquering department, which position he retained for several years. He was later given charge of the plating and finishing departments also, and he remained with this concern until 1918, when he accepted an offer from The Zapon Company, New Haven, Conn., for whom he took charge of sales in the western Connecticut territory. In 1921 he was transferred to the company's Chicago offices, where he became assistant manager, under the direction of Frank P. Davis. In 1923 he was transferred to New England again, to be manager of the New England division, in which capacity Mr. Oberender is still functioning.

Both Mr. and Mrs. Oberender have been familiar figures at nearly all the platers' conventions during the past ten years, and also at most of the eastern branch banquets, and their multitude of friends in the industry will join with THE METAL INDUSTRY in wishing them many more years of happiness and prosperity.

George L. Bitting has resigned as director of sales of the Bunting Brass and Bronze Company, Toledo, Ohio. He has made no announcement of his plans as yet and is expected to remain in Toledo for a time.

Charles L. Pack has resigned as first vice-president and assistant general manager of the Doehler Die-Casting Company and has established a consulting office in the Woolworth Building, Suite 2720, New York City.

Joseph P. McGinnis is now president and manager of the E. R. Caldwell and Son Brass Company, Syracuse, N. Y. Mr. McGinnis was formerly superintendent of the brass foundry department of Goulds Pumps, Inc., Seneca Falls, N. Y.

August Wilks has been appointed works manager of the Kearney and Trecker Corporation, Milwaukee, Wis. He was previously tool engineer of the Hoover Vacuum Sweeper Company, Canton, O., a position he held for five years.

R. V. Peters, for nine years in charge of the American Brass Casting Shop, Buffalo, N. Y., is now with the Bridgeport Brass Company, Bridgeport, Conn., where he is to have a similar position.

George F. Joyce has been appointed assistant sales manager for Chicago and vicinity by The Magnetic Manufacturing Company, Milwaukee, Wis. The Chicago office has been removed to 720 Cass Street, where there will be increased space and better facilities.

P. S. Menough has been appointed assistant to the president of the Duraloy Company, Pittsburgh, Pa. Mr. Menough was employed by the Eastern Malleable Iron Company, Bridgeport, Conn., as chief engineer for the previous nine years. He is a Cornell graduate.

George H. Adams is the new director of sales of The Bunting Brass and Bronze Company of Toledo, Ohio. Mr. Adams has had a large and varied experience with the sales and engineering problems of the bearing industries. Prior to his connection with the Bunting Brass and Bronze Company he was automotive engineer of the SKF industries, large manufacturers of bearings. He was also chief engineer of the Bock Bearing Company of Toledo, Ohio. His home is in Toledo where he will continue to reside.

Obituaries

Theodore W. Foster

Theodore Waters Foster, president of Theodore W. Foster & Brothers Company, jewelry manufacturers of Providence, R. I., died on September 30, at the age of 82.

Mr. Foster had been in business in Providence since 1880. He had been in the Civil War at the age of 18, and after the war he had joined his father and learned the jewelry manufacturing business. In 1873 he went in business for himself, in partnership with Walter E. White and Samuel H. Bailey, under the name of White, Foster & Company. This partnership was dissolved in 1878, Mr. White retiring. The remaining members of the firm formed Foster & Bailey, and in 1899, Mr. Foster acquired his partner's share of the business and incorporated under the name of Theodore W. Foster & Brothers Company, the name that is still retained. Mr. Foster was president and treasurer of the company, while his son, T. Clyde Foster, is vice-president, his nephew, Ernest T. Fuller, secretary, and his brother, Isaac F. Foster, superintendent.

Numerous patents were granted Mr. Foster, among them one on a spring device to prevent the unfastening of breastpins or brooches. He also is credited for an improved method of making gold front backs for sleeve buttons and the invention of a combined match box and cigar lighter and a large number of design patents.

Mr. Foster was a pioneer in recognizing the need of sanitation and ventilation in manufacturing plants and early in his career introduced an exhaust fan installation and an elaborate system of overhead piping to purify the air contaminated by gas flames used in soldering. He first installed and devised a system for removing the dust from the polishing benches and succeeded in making a polisher's occupation as healthful as any other.

Mr. Foster was a member of the Odd Fellows, G. A. R., Providence Board of Trade, Providence Art Club, Churchman's Club, Commercial Club, Squantum Club and R. I. Historical Society. He was a director of the National Exchange Bank, now the Exchange Branch of the Industrial Trust Company. He was also a director in the National Jewelers' Board of Trade.

Frank M. Cobb

Frank Martin Cobb, senior partner of the jewelry manufacturing firm of F. M. and J. L. Cobb, of Mansfield, Mass., died on September 27, in his sixty-ninth year. Mr. Cobb had been in poor health for some time, although he had not been confined to bed and was stricken suddenly.

Mr. Cobb learned the trade of toolmaker while a youth. In 1883, while still in his early twenties, he went to Mansfield from North Attleboro, Mass., where he became a member of the firm of Evans, Cobb & Company, later Cobb, Evans & Cobb, and, after Mr. Cobb and a cousin had acquired full ownership, F. M. and

J. L. Cobb. Besides his interest in the jewelry manufacturing business, Mr. Cobb was director of one bank and vice-president and director of another.

Robert W. Welch

Robert W. Welch, 63 years old, of Yardley, Pa., one of the employes of the John A. Roebling's Sons Company, Trenton, N. J., died recently at his home after a lengthy illness.

He had been connected with the Roebling firm for 35 years, having become affiliated with it in 1893, as a traveling salesman. When the firm opened a branch in Philadelphia, he was sent there as manager. He held the position until the time of his death.

The burial was in Laurel Hill Cemetery, Philadelphia.

—C. A. L.

Frank G. Drew

Frank Gifford Drew, chairman of the board of directors, Winchester Repeating Arms Company, New Haven, Conn., died on October 20 as a result of injuries sustained in an automobile accident which occurred while Mr. Drew was driving to New Haven from the convention of the Hardware Manufacturers and Jobbers Association, held at Atlantic City.

Mr. Drew was 55 years of age and had spent most of his life in the hardware and arms business. Until 1903 he was in the wholesale hardware business in Philadelphia. In that year he became a salesman for the Winchester company. He was elected president in 1924, and chairman of the board in 1927. He was vice-president of the Winchester-Simmons Company and the Simmons Hardware Company.

Clarence B. Hodges

Clarence Bidwell Hodges, a director and former vice-president of the Detroit Lubricator Company, died at his home in Detroit recently. He was 72 years old. He had been in poor health for the last several months. Mr. Hodges was born in Fond du Lac, Wis., to which place his parents had moved from Vermont. He came to Detroit with his family while a child. During his early adult years he became one of the founders of the Detroit Lubricator Co., the affairs of which occupied his attention until his retirement 12 years ago. After retiring from business he passed his summers at Seal Harbor, Me. and his winters in California, returning to Detroit in the spring and fall.

—F. J. H.

Samuel Newman

Samuel Newman, founder and owner of the Newman Manufacturing Company, Cincinnati, Ohio, died October 5. Mr. Newman was an extensive manufacturer of brass products, including brass beds, ornamental brass and bronze, castings of various non-ferrous metals and cast metal sculpture. He devised and originated methods of manufacturing metal products that are now in universal use. His estate was left to his three sons, who were in business wih him, to other relatives and to many hospitals and welfare organizations.

News of the Industry

Industrial and Financial Events

Roessler and Hasslacher Company

The Roessler and Hasslacher Chemical Company, New York City, on Wednesday evening, October 24, in recognition of faithful service gave tribute to 15 employees who had been with the company for over 25 years. The occasion was the annual banquet of the Parah Club, organized by the members of the company, held at the Masonic Temple, Perth Amboy, N. J. A delegation representing more than half of the New York office force was present. Addresses by executives and the entertainment led up to the presentation of awards in the form of gold watches to the following, who have been with the company for over 25 years:

Fritz Hoyler; Nels Milkelsen; Thomas Martenson; George Woitscheck; George Gardner; Charles Baumlin; J. Emil Kaus; James P. Cleary; Lawrence MacLeod; Frank Meyer; James McKeown; Joseph Urffer; Fred Steinmetz; Michael Ebner; C. M. Will. After the presentation of the awards an inspiring talk was given by Dr. Samuel Steinmetz.

Form Tin Trade Association

Representatives of the principal dealers, importers and brokers in tin, as well as two of the largest tin consumers in the United States, held a meeting on October 24 and formed the American Tin Trade Association. The objects of the new organization were set forth briefly as follows: To promote the interests of the pig tin trade, maintain just and equitable principles and establish uniform commercial usage in the trade; to distribute business information, and to adjust controversies by arbitration. A committee was appointed to carry out the work necessary for formation and incorporation of the body. The organization, it was stated, will not be a rival of the recently formed National Metal Exchange, but will rather complement that organization. All dealers, importers and brokers in specific qualities of tin are eligible for active membership, while others who are connected with the tin trade but do not come within that description are eligible for associate membership. A. B. Hall, of the National Lead Company, New York, is chairman of the committee.

Michigan Copper and Brass Company

Control of the Michigan Copper and Brass Company has been acquired by the American Smelting and Refining Company through exercise of an option taken in September for the purchase of 300,000 newly created class B shares with voting power at $10 a share. The option, which was to expire October 15, provided that 90 per cent. or more of the voting stock of the Michigan company must be deposited for sale at the price set. This provision having been complied with, the option was taken up.

At a corporate meeting in Detroit, new officers of the Michigan Copper and Brass Company were elected as follows: William H. Pierce, chairman of the board; George H. Allen, president; J. A. Doucett and J. C. Emison, vice-presidents; Charles S. Cook, treasurer, and George A. Brockington, secretary.

Canadian Nickel Exports Lower

After an unbroken record of increases each month up to August of this year, the exports of nickel from Canada in September showed a decrease as compared with the same month in 1927, according to official Canadian government reports.

Values and weights of various grades exported last month, as compared with the corresponding month of 1927, are as follows:

Grade	Pounds 1927	Pounds 1928	Value 1927	Value 1928
Nickel in ore	5,896,800	1,713,800	$884,463	$257,041
Nickel oxide	345,500	417,800	105,454	136,172
Nickel fine	2,504,100	3,835,300	659,948	982,395
Total	8,746,400	5,966,900	$1,649,865	$1,375,608

Examination of the above figures shows that the decrease is due to a reduction in exports of nickel in ore, which is reported to be almost entirely exports by the Mond Nickel Company. In the nickel oxide and nickel fine there are considerable increases. These latter

classifications are made up almost wholly of products from the International Nickel Company.

During the first nine months of this year the total exports of all grades of nickel amounted to 71,279,100 pounds, which is an increase of 19,739,400 pounds above exports for a similar period in 1927. The export valuation of nickel for the first nine months of 1928 was $15,839,255, representing a gain of $4,744,469, or 42 per cent., in excess of that for the corresponding months in 1927.

Chromium Engineering Corporation

The Chromium Engineering Corporation, with offices at 246 Fifth Avenue, New York City, has recently added a new division to its business. Previously, this corporation only handled the supervision and installation of chromium plating plants for manufacturers and job shops. Now they will also maintain and operate a large plant of their own for the convenience of the manufacturers who have chromium plating work but not in sufficient quantity to warrant operating their own plating plant.

The Chromium Engineering Corporation has ample facilities to chromium plate anything from a pin or watch case to automobile radiator shells or bumpers.

Stebbins-Rich Company Leases Plant

The Stebbins-Rich Brass Manufacturing Company, Cleveland, Ohio, manufacturer of plumbing supplies, has leased from the Cleveland Railway Company a building at 6723 Denison Avenue, Cleveland, which will be utilized as a factory. The Stebbins-Rich company recently took over the business of the Apex Brass Manufacturing Company.

International Silver Company

International Silver Company reports for the quarter ended September 30, a consolidated net income of $291,255 after Federal taxes and other charges. This compares with $342,604 a year previous. Net income for the first nine months of the current year was $767,391 against $982,635 the same period last year.

Chase Brass to Build Midwest Mill

Cleveland, Ohio, has been chosen by the Chase Brass and Copper Company of Waterbury, Conn., as the location for a new brass and copper mill which the company has for some time planned to build in the central west, according to press reports.

American Lead Company

The American Lead Company, Indianapolis, Ind., has been incorporated under Indiana laws to take over the business of the Alloys Refining Company. Authorized capital is $200,000, and the company will smelt and refine lead and other white metals and manufacture sundry white metal products. Officers are: Edwin S. Pearce, president; Walter Schoenbach, vice-president and general manager; Burrel Wright, secretary and treasurer.

Horse Head Zinc in Byrd Expedition

When the telephone and radio apparatus carried by the Byrd Antarctic Expedition is set up far from civilization in the frozen wastes of the south, the power supplied by the batteries will be dependent upon the performance of a New Jersey Zinc Company product—"Horse Head" rolled zinc. This metal, in the form of a cylinder, acts as the positive element in the batteries which were manufactured by The Waterbury Battery Company, the New Jersey Zinc Company states.

Germans to Use United Chromium Process

According to cables received in this country, the Langbein-Pfanhauser Works, Germany, has made an agreement with United Chromium, Inc., Detroit, Mich., under which the German concern will use a chromium plating process controlled by the American company.

Grasselli Chemical Company

Plans for consolidation of E. I. du Pont de Nemours and Company and the Grasselli Chemical Company were announced from the offices of the former on October 22. A part of the announcement follows:

"An agreement has been entered into between E. I. du Pont de Nemours and Company and the Grasselli Chemical Company of Cleveland, having as its object a consolidation of the interests of the two companies.

"This agreement, if approved by the stockholders of the Grasselli Company at a meeting to be called for November 10, provides for the combination of the heavy chemical business of the two companies, which will be carried on under the long established name of the Grasselli Company. No important changes are contemplated in the present administration of these activities.

Make Trans-Atlantic Phone Cable

A new cable, by means of which the transmission of telephone messages between the United States and Europe will be considerably facilitated, has been perfected by the Bell Telephone Laboratories, according to a statement by Walter S. Gifford, president of the American Telephone and Telegraph Company. The cable will entail the use of permalloy, which the company perfected some years ago, and which was fully described in THE METAL INDUSTRY at the time. The new cable is to be wrapped from end to end in a thin layer of permalloy, it was stated, which has the property of aiding in maintenance of the current, failure of which over such a long line has hitherto prevented the voice from being sent such a long distance without "stepping up" en route.

Fluorspar Tariff Raised

President Coolidge on October 17 issued a proclamation invoking the flexible provision of the tariff act to increase the duty on imports of fluorspar, containing not more than 93 per cent. of calcium fluoride, from $5.60 per long ton to $8.40 per long ton. The increase takes effect thirty days from that date.

The action was based upon a report by the Tariff Commission, which stated that the increase in the duty on fluorspar imports was necessary to equalize the difference in costs of production in the United States and in England, the principal American competitor.

Fluorspar is used principally as a flux in metallurgical processes, as an ingredient in products of the ceramic industries, such as enamels and opal glasses, and in the manufacture of aluminum.

Western Electric Company

The Western Electric Company has acquired 125 acres of land in Baltimore upon which to erect a $15,000,000 plant for the manufacture of telephone cable and wire, it was announced on October 30 by Edgar S. Bloom, President. Baltimore was selected partly because of its rail and water transportation facilities.

Monarch Aluminumware Company

A half interest in the Monarch Aluminumware Company, Cleveland, Ohio, has been purchased by the Club Aluminum Utensil Company, Chicago, Ill., according to an announcement by William A. Burnadette, president of the latter concern.

Electrical and Industrial Exposition

The first National Trade Show of electrical appliances and equipment ever held in the United States, which preceded 21st Annual Electrical and Industrial Exposition, opened at the Grand Central Palace, New York City, on Wednesday, October 17, and continued for three days. Three floors of the Grand Central Palace were filled with exhibits, including thousands of household appliances and electro-therapeutic apparatus. More exhibitors were showing this year than ever before in the history of the exposition. Many new inventions of electrical equipment were displayed.

The show opened to the general public on Saturday, October 20,

and continued until the following Saturday. Demonstrations of the latest practical discoveries in radio television were made daily, with visitors being televised.

Incorporations

J. L. Marks and Son, Inc., Syracuse, N. Y., has been incorporated with $35,000 capital, to manufacture jewelry.

Indiana Smelting and Refining Corporation, Indianapolis, Ind., has been organized with $100,000 capital to take over business of Indiana Smelting and Refining Company, established about 10 years ago, and specializing in white metals. The new concern is moving into a new plant where increased space and personnel will permit manufacture of brass, bronze and aluminum ingots, etc., in addition to the company's line of white metals and alloys. The firm will also continue to deal in all grades of non-ferrous scrap and residues. Officers are Max Robbins, president; Morris Isaacson, vice-president; George S. Glazer, secretary-treasurer.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

NOVEMBER 1, 1928.

Rumors mentioned two months ago of merger negotiations between the **Chase Companies, Inc.**, of this city and the **Michigan Copper and Brass Company** of Detroit have been revived again last month with a change, namely that the **American Smelting and Refining Company** is negotiating to acquire both and also the **Bridgeport Brass Company** and the **Rome Brass and Copper Company, The Baltimore Brass Company** has also been mentioned in these reports. Two months ago, when the first merger rumors were heard, although no copper producing company was mentioned, it was reported that some copper company would also be involved in it. At that time, **Frederick S. Chase**, president of the Chase Companies, Inc., declared in positive terms that no negotiations were in progress involving his concern in any merger.

A second rumor concerns the **Scovill Manufacturing Company** rather than the Chase Companies, and is to the effect that Scovill is negotiating to acquire the **Bridgeport Brass Company** and the group of small factories that **Charles E. Beardsley** of this city brought together under the **Beardsley and Wolcott Manufacturing Company** of this city, of which he is president. This latter company was formed by the acquisition of the **Wolcott Manufacturing Company** of Hartford by the **Beardsley Manufacturing Company.** Two months ago it acquired the **Berbecker and Rowland Manufacturing Company** of this city. Mr. Beardsley was made president of the **Bridgeport Brass Company** about a year ago and it was reported then that he was chosen by the heirs and trustees of the estate of the late **F. J. Kingsbury**, who, in addition to being the largest stockholder of the **Bridgeport Brass Company,** was a heavy stockholder in Scovill's and the group associated with Mr. Beardsley is understood to be interested in Scovill's. However, Mr. Beardsley denies that any negotiations are in progress for the acquisition of the companies he heads by the Scovill company. **The Bristol Brass Company** has been mentioned in this connection also.

The Federal Manufacturing Company, of this city owner of patents and manufacturer of curtain rod fixtures, has purchased the land, buildings, machinery and other assets of the **Woolson Manufacturing Company** of Watertown. The Woolson Company was formed in 1831 and originally made umbrella trimmings, but it sold this business some years ago to **S. W. Evans and Sons.** It makes electric lighting loops, radiator caps, cane ferrules and metal stampings. Mr. Hayward will remain with the new firm as general manager. The Federal Company will continue to operate its plant in this city as well as in Watertown, distributing the manufacture of its products and those of the Woolson works between the two plants.

In connection with the change in trade mark of the **Chase Companies, Inc.**, it is stated that one million labels had to be changed and 1,000 designs altered. **Fred Cooper,** who designed the new trade mark, changed his model 100 times before securing the one decided upon. Over 100,000 letters have been sent out by the local office notifying the trade of the change. The new trade mark was reproduced on page 454 of our previous issue.

The Waterbury Steel Ball Company has been acquired by the **Shatz Manufacturing Company** of Poughkeepsie, which in turn is affiliated with the **Federal Manufacturing Company** of that city and Waterbury. **The Waterbury Steel Ball Company,** capitalized at $200,000, was formed 16 years ago. It manufactures a varied line of steel balls used in the automobile industry. It has been employing about 100 men. The Shatz company and the Federal company employ about 700 men and have about 14,000 square feet of factory floor space. They make bearings for Studebaker, Reo, Ford, Graham-Paige, Hudson, Moon and Auburn cars and for the Western Electric and General Electric.

John P. Goss, vice-president of the **Scovill Manufacturing Company,** appeared before the directors of the state prison last month with other manufacturers to urge that the contractors for prison labor be forced to pay the prisoners wages more in keeping with the wages paid in factories. The hearing was in connection with the bill before Congress that will give states the right to forbid the entrance within their borders of prison-made goods. Mr. Goss said that while the prison directors have considered the problem from its sociological side, they have not considered the economic side, which affects the manufacturers of the state, although that constitutes 50 per cent of the problem. The unfairness to manufacturers of the competition of prison labor may be eliminated by paying the prisoners more wages, he said.

Damage amounting to $5,000 resulted from the fire last month at one of the storehouses of the **Chase Companies'** plant at Waterville. The fire was extinguished before it had spread to other parts of the plant.

The Chamber of Commerce reports for September, 33,866 persons employed in 46 concerns employing over 100 and a total of 19,030 employed in the eight largest concerns. This is an increase of 853 as compared to the same month last year. It reports a $45,000 addition started by the **French Manufacturing Company** and a smaller addition started by the **Eyelet Specialty Company.** It reports over 20 concerns making parts for the airplane industry.

E. W. Goss, of the **Scovill Manufacturing Company,** as the Governor's fuel representative, appeared before the **Interstate Commerce Commission** in Boston, stating the plea of the state and the manufacturers of the state for reduction of the freight rates on coal from the ports of the state to the interior.

Representatives of the **Western Electric** and the **General Electric** are expected to visit the **Bristol Company** plant here soon to inspect the company's new "Bristolphone" with the idea of having them installed in theaters in connection with the talking movies. —W. R. B.

Connecticut Notes

NOVEMBER 1, 1928.

HARTFORD.—Reorganization of the **Billings and Spencer Company,** which has been in a precarious condition for many years, has been voted by the directors of the company. Business has been improving for more than a year and after several years of losses, a profit of $82,000 was shown in 1927. A new company, as yet unnamed, is to be formed which will take over the assets of the old company, issuing common stock in exchange for the preferred and common stock of the old company, share for share. The preferred stockholders of

the old company will receive one additional share for each five shares held, the same to be reimbursment for the unpaid back dividends. The new stock will have a par value of but $10 a share compared to the par of $25 on the old stock. Also, preferred and common stockholders of the old company will have the right to subscribe for stock in the new company, holders of 10 shares being permitted to receive 15 new shares in payment of $50, after which they will also receive three shares additional, giving the rights a theoretical value of $3. Through this plan, the company's unsecured notes and obligations to the sum of $762,000 and its 7 per cent bonds to the amount of $500,000, and its preferred dividends amounting to $350,000 will be wiped out in addition to its interest charges of $84,000 annually. The new officers will be: chairman of the board, David Post; president and treasurer, Frederic Billings; vice-president and general manager, A. H. Deute; secretary and assistant treasurer, C. T. Smith; directors, the above and Richard Goodman, Edward Milligan, Lucius Robinson, Nelson Smith and L. E. Zacher.

Stock of the new **Veeder-Root Company** has been listed trading on the Hartford Exchange. The company has secured a contract from the **Gotham Hosiery Company** for the installation of counting devices to be applied to its knitting machines. Negotiations are also in progress for the installation of counting devices in automatic vending machines. The company supplies measuring dials and registering devices used on gasoline and oil pumps.

Manufacturers from all over the state attended a conference held here October 24th sponsored by the **Department of Commerce** to encourage the development of foreign markets. **Dr. Julius Klein**, director, and Eric King, chief of the Specialties division, of the Bureau of Foreign and Domestic Commerce and other experts in foreign trade, spoke to the manufacturers, advising them as to foreign marketing aids.

Large contracts for typewriters from the Soviet Government of Russia are expected to be secured by the local typewriter companies, **Underwood, Royal** and **Remington.** This is an aftermath of the $26,000,000 General Electric trade contract with that country and the State Departments statement that it does not object to such contracts. Russia wants typewriters and prefers American makes. One possibility discussed is the building of a factory in Russia by one of the local companies.

BRIDGEPORT.—"Our charts and statistics indicate that within the past 12 months industrial activities here have been extremely steady and satisfactory," **Alpheus Winter**, secretary of the **Connecticut Manufacturers Association**, states: "I can see no reason why this should not continue throughout the winter." The association is constantly in touch with all the larger industrial concerns and through the reports it receives maintains charts which serve as barometers of the city's business.

Stanley Bullard, of the **Bullard Machine Tool Company** says his company anticipates continued operation on the present schedule or better right into the new year. The new addition being erected at the Bullard plant will facilitate production and slightly increase the number of men employed.

NEW BRITAIN.—The Stanley Works has purchased property on Lake Street, formerly known as the Shepard Place, from Algeron and Annie Alderson. It has a frontage of 186 feet and brings the Stanley Works holdings adjacent to those of the **American Hardware Corporation** on the same street.

Members of the **Landers, Frary & Clark** 25-year club held an outing and shore dinner at the Pease House, Saybrook, last month. Addresses were made by **President A. G. Kimball** and **Chairman C. F. Smith** of the company. The total membership of the club is 165, all having served 25 years or more with the company.

Superintendent Ernest W. Pelton of **The Stanley Works** has completed 25 years of service with the company and has been made a member of the Stanley Quarter Century Club. **President C. F. Bennett** of the company made the presentation at last month's meeting.

A Home Progress Exhibition was held in the Stanley Arena the week of October 1. Products of **Landers, Frary and Clark, P. and F. Corbin, Skinner Chuck Company, Fafnir Bearing Company, Beaton and Cadwell Company, Union Manufacturing Company, American Hardware Company, Stanley Works** and **North and Judd Manufacturing Company** were shown.

The new spring shackle bearing of the **Fafnir Bearing Company** has been adopted as standard equipment by the **Studebaker Corporation.** As this is a new line of production for Fafnir, it is expected to swell the company's business volume.

NAUGATUCK.—Through the efforts of **Harris Whittemore,** three airplane and airplane parts manufacturing companies have been located here. The first, the **Aeronautical Products Company,** has been in operation for several months. It makes a four-cylinder air-cooled motor, embodying several unique features. It has but 50 moving parts and is equipped with cantilever valve springs on which the company has a patent. It is headed by **H. Alex Johnson. The Kimball Aircraft Corporation,** formed and financed by local men, will begin production shortly on small, radial, air-cooled engines, designed for use in small popular priced planes. It has acquired the old Dunham Mills plant, employs 30 men and is capitalized at $100,000. It has produced three motors which have run successfully for over 110 hours each and has upwards of $200,000 in orders on its books. It will also produce a 135-horsepower radial engine developed by its own engineers. Its officers are: President, L. C. Kimball; vice-president, Clayton S. Klein; treasurer, Harris Whittemore; secretary, Clarence Austin; chief engineer, Augustus Hassbrouck. These men and **Capt. Edmund Cairns** are forming another company to produce small, popular-priced, all-metal planes using four cylinder, double opposed air cooled motors of 60 to 80 horsepower to be made by the Kimball Company. It has acquired part of the **United States Rubber Company's** plant for a factory.

BRISTOL.—A new forge plant is being erected by the **New Departure Manufacturing Company,** to be completed by about January 1, 1929, according to announcement by the production manager, **Charles B. Simmons.** The new building will cost about $100,000. It will be 200 feet long and will be an extension of the present forge plant, which is 600 feet in length, making the longest plant of its kind in the country.

TORRINGTON.—A local manufacturers' exposition is to be held in this city beginning Nov. 5. Exhibits of all the local factories will be placed on display in the state armory. The American Brass Co., Torrington Co., Torrington Mfg. Co., Hendey Machine Co., Union Hardware Co., and other firms will have displays.

WINSTED.—The William L. Gilbert Clock Company, since October 1, operated on a full time basis in all departments. For several months previous, most of the departments were operating but four and five days a week.

THOMASTON.—The Seth Thomas Clock Company has inaugurated a 50-hour week working schedule. Previously, for several weeks none of the departments worked over 40 hours a week.

TERRYVILLE.—The cabinet lock, door lock and part of the padlock departments of the **Eagle Lock Company** have gone on a 40-hour a week basis. The men will work eight hours a day for five days. —W. R. B.

Providence, R. I.

OCTOBER 31, 1928.

Sixty-eight individuals, firms and corporations representing or affiliated with the metal trades are included in the list of taxpapers of Providence whose property valuation is assessed at $50,000 or more by the Board of Tax Assessors, according to their report certified early the past month to the City Treasurer for collection. The total valuation of these 68 taxpayers is $26,252,060.

Henry Williams and Son, manufacturing jewelers, 107 Friendship street, Provjdence is owned and conducted by **Walter E. Peck** of Providence and **Joseph H. Semple** of North Attleboro, according to their statement filed at the city clerk's office.

Esther's Lacquering and Finishing Company, Inc., has been granted a charter under the laws of Rhode Island to conduct a coloring lacquering and finishing business in Providence with an authorized capital stock consisting of 300 shares of common stock without par value. The incorporators are Carmen S. Felch, George W. Klein and Rudolph O'Larte.

The Armbrust Chain Company, 80 Clifford street, Provi-

dence is operating its plant on an overtime schedule to keep up with the demand for their products.

Parks Brothers and Rogers, manufacturing jewelers, have removed their plant from the seventh to the sixth floor of the Manufacturers' Building, 7 Beverly street, Providence where the floor capacity is largely increased.

Providence Brass and Aluminum Foundry Company, 219 Aborn street, Providence, is being operated by **Arsen G. Avedisian,** according to his statement at city clerk's office.

Liberty Tool and Gauge Works has removed its plant from Woonsocket to Providence and according to notice filed at the office of the Secretary of State, has changed its capital stock from $40,000 to 50,000 shares of common stock without par value.

The Abrasive Tool and Machinery Company, located on Dexter road, East Providence, is erecting an additional building at its plant. The new Building is to be about 150 feet in length and 60 feet in width and will be erected of steel and concrete at a cost of approximately $20,000.

The Standard Watch Case Company, Inc., has filed notice with the Secretary of State's office of an amendment to its charter whereby, under the laws of Rhode Island, its authorized capital is increased from $300,000 to $500,000.

The E. A. Eddy Machinery Company, has completed the installation of the new machine shop for the vocational department in the new high school at Cranston, R. I. The shop contains six South Bend motor drive lathes, a milling machine, drills and other apparatus and equipment necessary for a complete machine plant. All the machines are new ones making it one of the most up-to-date educational machine shops to be found in any school in the country.

Articles of incorporation have been filed under the laws of Rhode Island by **Kaplan Brothers, Inc.,** to engage in the jewelry business. The incorporators are **Samuel Kaplan, Israel Kaplan and David Swartz,** all of Providence, and the authorized capitalization is 100 shares of common stock without par value.

Nels G. Berkander, has removed his electro-plating establishment from 35 Garne street to 65 Clifford street where he has more commodious quarters. The new plant has been equipped with a large amount of new machinery and apparatus.

Jacob H. Orchoff has filed notice at the city clerk's office that he is the proprietor of the **Peters Manufacturing Company** manufacturing jewelers, 220 Eddy street, Providence.

A. P. Workman Manufacturing Company, Inc., to be located at Providence for the manufacture of jewelry and novelties, with a capital of 200 shares of common stock of no par value, has been granted a charter under the laws of Rhode Island. The incorporators are Abraham P. Workman and Samuel H. Workman of Providence and Samuel G. Honig of Brooklyn, N. Y.

Edward L. Byers, Commissioner of Labor for Rhode Island, in announcing the results of his monthly survey of the industries of this State with especial regards to employment, states that employment in 101 establishments in the State, including four of the major industries among which are the manufacturing jewelry, silver smithing and the metal trades, showed an increase of five per cent during the month of September, as compared with the July record. This gain represents an increase of 2,706 persons. The jewelry industry leads all others with a jump of twenty per cent, there being 175 more persons employed last month than in August and 1156 more than in July. Nineteen jewelry establishments made returns to Commissioner Byers, showing 4,819 persons employed in July, 5620 in August and 5975 in September. In commenting upon the jewelry industry, Commissioner Byers said: "During September this industry continued to show the usual seasonal increase of activity, with an increase of 20.3 per cent over the July report, although if the total for July had included those plants which closed for vacations, the September increase would be but 9.7 per cent." Twelve metal trades establishments reported a gain of 2.4 per cent concerning which Commissioner Byers says: "The shortage of highly skilled mechanics reported last month in the metal trades has continued during September." The twelve establishments recorded reported the employment of 9,101 persons in July; 9,239 for August and 9,322 for September.

—W. H. M.

Middle Atlantic States

Newark, N. J.

NOVEMBER 1, 1928.

The Driver-Harris Company, Harrison, has sent out warnings against manufacturing or selling carburizing or other "case hardening" containers embodying an invention assigned to the company. The warning is issued because of a recent decision by the United States Court of the Southern District of New York.

It has been the practice of metallurgists to case harden steel by packing it in a suitable container with a compound rich in carbon and heating to a temperature of about 1,700 degrees Fahrenheit. The importance of case hardening in the development of mass manufacture can hardly be overestimated. The quantity production of typewriters, bicycles and automobiles and all parts depends on it. The court's decision granting an injunction and accounting, accords the inventor credit for "a tremendously valuable contribution to the heat treating business." The concern now holding these rights, **The Driver-Harris Company,** was incorporated in 1899 and has grown steadily until it is the largest concern making electrical resistance alloys in the world. It operates plants at Harrison and Morristown and maintains offices in Detroit, Chicago and Cleveland. The company does an extensive foreign business and operates plants at Manchester, England, Paris, France and in Italy. It has agents throughout Europe. The plants have equipment for melting hot rolling and cold drawing alloys for electrical, chemical and mechanical uses and foundries for the production of alloy castings.

Following Newark concerns have been incorporated: **Orchare Smelting and Refining Company, Inc.,** $100,000 for refining metals. **A. C. Neon Corporation,** Newark, 2,500 shares, to manufacture radio supplies. Colonial Laboratories, Inc., $75,000 preferred and 1,000 shares no par, manufacture chemicals.

—C. A. L.

Trenton, N. J.

NOVEMBER 1, 1928.

Trenton metal manufacturing plants are reported to be running normally. The order received by the **John A. Roebling's Sons Company** some time ago for furnishing the cables for a large suspension bridge is keeping the plant busy. The The Roebling company secured about $13,000,000 of the contract. Considerable copper is being used in the manufacture of the cables.

Richard Duane Green, an employe of the **John A. Roebling's Sons Company,** has been granted a patent by the United States patent office for the invention of a sawing wire. The wire consists of a strand formed of a plurality of wires laid up helically in the same direction in contact with a single centre element and held out of contact with each other to provide large abrasive carrying areas. The patent has been assigned to the Roebling company.

A process of manufacturing magnesite brick is covered by a patent granted to **Edgar A. Slagle,** of Trenton, and Berry Marvel O'Hara, of Westfield, N. J. They have assigned the patent to the **American Smelting and Refining Company,** New York.

Following concerns have been incorporated here; **Hydroproof Chemical Corporation,** 2,500 shares no par, chemicals, Jersey City. **Change Water Manufacturing Corporation,** Washington, $100,000 preferred and 500 shares no par, manufacture plumbing supplies. **Crown King Mines Corporation,** Montclair, $25,000; ores and minerals. **New Jersey Screen Company,** Milburn, $125,000, manufacture screens. **Safety Signal Corporation** of New Jersey, Montclair, $50,000, manufacture signals. **Super-Heid Service Company,** Passaic, $15,000, aluminum goods. **Chemical Manufacturers and Brokers, Inc.,** Jersey City, 1,000 shares, manufacture chemicals.

—C. A. L.

Middle Western States

Detroit, Mich.

NOVEMBER 1, 1928.

The **Hall Lamp Company** recently obtained contracts from the **Chrysler Corporation** covering lamp requirements for the DeSota line and the Victory Six of the **Dodge Brothers** division, it is announced. The DeSota and Victory constitute additional business for the company, which, it is said, will amount to a total sales volume of $2,500,000 in the course of a year.

The **American Enameled Products Company**, of Mt. Pleasant, Mich., reports that during September more products were shipped from its plant than during any other month in the history of the company. The month's output amounted to approximately 234,000 pounds.

Ground has been broken for erection by the **Carborundum Company**, of Niagara Falls, of a general warehouse and district sales office building in Detroit. It is located at East Grand Boulevard and the Michigan Central tracks. The Detroit building will carry a complete line of grinding wheels, abrasive paper, polishing grains, and other abrasive and refractory products manufactured by this company.

Control of the **Michigan Copper and Brass Company** has passed to the **American Smelting and Refining Company**, through a purchase of a majority of the Class "B" stock at $10 a share, it was announced in Detroit on October 10.

This is the second of Detroit's largest metal-working plants to pass into new hands, control of the Detroit Copper & Brass Rolling Mills having gone to the Anaconda Copper Mining Co. The deal, it is said, involved the payment of $3,000,000 cash for the class B stock.

The Detroit chapter of the **American Welding Society**, which is affiliated with the **Associated Technical Societies**, at its fifth annual meeting elected **R. G. Richards**, manager of the welding department of the **Barnes Wire Fence Company**, president; **M. C. Echman**, superintendent of welding for the **Ford Motor Company**, vice-president; **Albert LaPoe**, of the **Westinghouse Electrical and Manufacturing Company**, secretary and treasurer. The executive board will be appointed later by the president. Particular interest will be devoted to an educational program during this year, it is announced. The society plans to make better known the uses and advantages of welding, especially in structural work.

Ground has been broken at French road and Madola avenue, Detroit, for the construction of a $1,000,000 office building and plant for the **Clayton and Lambert Company.** This organization also has acquired several more acres directly opposite the site of the proposed new municipal airport. The ground will be available for future expansion. Clayton and Lambert produces all types of metal stamping, blow torches, firepots, folding stoves, etc. Plans call for minimum employment of 600 men which will be increased to 1,000 on demand. Charles F. Lambert, president of the company, said recently, that while he recognized the market for automobile parts is now the best in years, the directorate of his company was considering entrance into other industries.

The Aluminum Industries, Inc., Cincinnati, on October 1, opened general sales offices in the new Fisher Building in Detroit. **Arthur G. Eaton**, recently elected vice-president and director of sales, is in charge. For 15 years Mr. Eaton was connected with **Dodge Brothers, Inc.**, the last four as director of the purchasing department. His recent election as vice-president and appointment as director of sales of the Aluminum concern is said to be a part of a program of expansion. Heretofore, Aluminum Industries, Inc., has been represented in Detroit by B. J. Plumley, engineer, serving in a technical capacity, who will continue to be associated with Mr. Eaton, it is stated.

Harris-Beasley, Incorporated, is the name of a new concern in Detroit engaged in general metal polishing and plating. Its capital stock is $10,000. The owners are Elmer E. Becker, P. R. Beasley and Howard Ehmke, 1304 Harper Avenue, Detroit.

Capital Aircraft Company, Lansing, Mich., airplane builders, is now speeding production, it is announced by **D. D. Thomas**, president. Recently work was delayed by failure to receive motors. The first plane built at the plant has been christened "Aeolus," after the ancient Greek god of the winds.

The Wilcox-Rich Corporation has been incorporated at Detroit for the purpose of dealing in automobile parts. Stockholders are Raymond K. Dykema, Allen B. Schall and C. H. L. Flintermann, 2102 Buhl building, Detroit.

An order for ten all-metal tri-motored Ford Airships, powered with "Wasp" motors and having a capacity of 14 passengers each, has been awarded to the **Ford Motor Company** by the **Transcontinental Air Transport, Inc.** The ships, when completed, will be valued at $650,000 and are to be delivered in December. Ford plans were recommended following a conference in Detroit between **Major Thomas G. Lanphier**, director of operations for the air line, and officials for Ford. —F. J. H.

Cleveland, Ohio

NOVEMBER 1, 1928.

Cleveland is on the eve of a new epoch in industrial expansion, according to **F. F. Duncan**, financial expert. It will be comparable to the notable five-year period from 1913 to 1918, when new industries swarmed to lay the foundation for the 1,010,000 federal population estimate of Cleveland today. **J. D. Kunkle**, of the **Kunkle Factory Site Service Company**, in a recent statement, said: "We now have more inquiries for factory space and for factory sites than at any time since 1920." Most of the new concerns are unsolicited, it is stated. Added to this, most of the old established concerns are now engaged at capacity production, this being particularly the case with brass, copper and aluminum plants. General business conditions in Cleveland and the surrounding territory are exceedingly promising for the next several months. Instead of a recession during the late fall and winter as often happens, nothing of the sort is expected. Neither has there been any falling off in industrial activities owing to the presidential campaign.

The Stebbins-Rich Brass Company, recently announced plans for increased manufacturing capacity. Other concerns of a like nature also are planning expansion, it is stated.

The Briggs Manufacturing Company, Detroit, manufacturers of motor car bodies and consumers of large amounts of brass and copper, plans soon to open its Cleveland plant which has been idle for a long time. —F. J. H.

Toledo, Ohio

NOVEMBER 1, 1928.

Production in the brass, copper and plating plants in this city has been steady during the past month and conditions are favorable for a continuance of present conditions. Practically all the plating plants have about all they can handle. Business in general is favorable throughout this territory and no one is looking for anything in the way of a curtailment during the fall or winter.

Motor car accessory manufacturers are heavily engaged with orders ahead to keep them busy for a considerable time.

Toledo is blessed with a varied line of industries and many of them maintain plating plants of their own. It would be a difficult matter today to locate any particular one that is not more or less active. —F. J. H.

Chicago, Ill.

NOVEMBER 1, 1928.

The Dallas Brass and Copper Company, 820 New Orleans Street, Chicago, has purchased the remainder of the vacant land in the West Grand Avenue industrial district to provide for future expansion. This comprises 466,356 square feet of vacant space. Previous to the acquisition of this property, which was made by **Charles D. Dallas**, president of the company, the concern owned about 490,000 square feet upon which the present factory and mill are situated.

A fire which started on the top floor of a five story brick building occupied by the **Chicago Plating Company**, did

damage to the property to the extent of $5,000, before it was extinguished.

The Industrial Metals Laboratories has been incorporated in Chicago with a capital of $50,000 for the purpose of engaging in the business of industrial and ceramic chemists. Signers of the articles of incorporation are Grace R. Leigh, Helen W. Rehm and W. B. Fairfield.

S. W. Lindheimer, Inc., is a new Illinois corporation with headquarters in Chicago. The company has been incorporated for $25,000 to deal in new and used metals. Incorporators are Gertrude Lindheimer, Harry L. Rudnick, Norman T. Adelson.

P. C. Gibson and Co., has been incorporated at Waukegan, Ill., with a capital of $25,000 to manufacture and deal in metal castings, stampings, bibs, faucets, and plumbing parts and fixtures. Signers of the articles of incorporation are R. M. Hubler, V. M. Hubler, M. Gibson and P. C. Gibson.

—A. P. N.

Wisconsin Notes

NOVEMBER 1, 1928.

The Western Malleables, Inc., Beaver Dam, Wis., is installing a new air compressor which has a capacity of 1,300 cubic feet per minute and which will replace the steam boiler equipment now being used, according to **H. L. Kirsh,** general manager of the concern. The new equipment will double the compressed air capacity of the plant and will be of aid in enabling molders and casting cleaners in getting out their work. The concern is employing about 400 men at present and producing between 40 and 50 tons of castings daily.

Work has been started on the new seven story office and warehouse building being erected at Manitowoc, Wis., by the **Aluminum Goods Company.** Plans have also been made for the erection of a one story factory by the company at Two Rivers, Wis., at a cost of $450,000.

The Badger Zinc Company, operating the Rule and Jewell mines at Linden, Wis., employs 60 men on double shifts daily. Extensive exploration work with drills show continuous veins of zinc ore insuring large operations over a period of years to come. Reports have it this company is considering the installation of a "flotation" plant for the recovery of zinc ore, the plant to cost approximately $20,000. The Ellis mine at Dodgeville is also owned and operated by Badger.

Announcement was recently made that the **Matthiesen and Hegeler Zinc Company,** La Salle, Ill., has made a contract with the **Vinegar Hill Zinc Company,** for its Wisconsin output. The **Vinegar Hill Zinc Company,** is a unit of the **Youngstown Sheet and Tube Company,** and operates a battery of heavy zinc ore producers in the Shullsburg and Hazel Green districts. The production is heavy but a large part of the output is shipped to the National Zinc works at Cuba City, where it is refined and reduced to high grade smelter.

—A. P. N.

Other Countries

Birmingham, England

OCTOBER 19, 1928.

The Birmingham jewelry, silverware and electroplate manufacturers have arranged to be represented at the forthcoming **British Industries Fair** by a composite stand in the London Section. It is understood that the combined exhibit will have an enormous scope and be of the utmost interest to buyers. Silversmiths in Birmingham state that Autumn buying has opened up earlier than usual and prospects are good. The London trade is maintaining its vigour but otherwise the home market is feeling the effects of depression in the staple industries, as travellers' reports from many parts of the country testify. Some of the export markets are reviving. The Argentine is placing better orders than for several years past, Brazil is more active and India an improving market. Birmingham silversmiths are also confident of increasing the turnover with Canada this year. The jewelry and allied trades have been robbed of their skilled labor by the long depression and it is with great difficulty that recruits are secured for the rush of orders in hand for Christmas. The vogue of platinum as a setting for jewels is still growing and some retailers are returning rings from stock to the makers to have gold replaced with platinum. The money available for such luxuries as gold and silver is still being diverted in other directions to a very great extent.

Makers of cutlery and plate in the Sheffield district are reporting a good deal of activity and it is expected that the volume of business between now and the end of the year will be equal to that of the normal level for the season. For best cutlery and plated hollow ware the demand is steady, but small in relation to the cheap goods. There is still an extensive demand for table ware of glass which many housewives prefer to metal because that material is easier to keep clean. The plating of metals with pure chromium is making headway, both in Sheffield and Birmingham, and all the evidence points to the conclusion that the new process has gained a permanent place in British industry.

The non-ferrous tube makers of Birmingham have found orders declining lately although the works have a good many contracts to work off. The rise in electrolytic copper is expected to give a spurt to the trade. Competition is keen amongst home producers as well as from foreign producers in overseas markets. The shipbuilding demand from the ports is disappointing. Makers of tinned hollow ware are steadily employed although this is not regarded as a good time of the year in this trade. For the better classes of aluminum hollow ware demand is not so good.

—J. H.

Business Items—Verified

Lionel Corporation, 605 East Twenty-first Street, Irvington, N. J., will construct a one and two-story warehouse, 390 by 620 ft., to cost over $200,000 with equipment.

The Roller Smith Company, 233 Broadway, New York City, has appointed **Arthur H. Abbott, Inc.,** 88 Broad Street, Boston, Mass., its district sales agent for the New England territory.

The Dorchester Brass and Aluminum Foundry, Inc., Boston, has been incorporated with capital of $1,000 no par shares. Martin W. Riley, Oscar W. Swangren and Mary J. Riley, all of Boston, are the incorporators.

French Manufacturing Company, Waterbury, Conn., has let a contract for construction of a one-story addition, 60 by 200 ft., which will cost about $50,000 without equipment. The company manufactures bronze and copper tubing.

Fisher Brass Company, Marysville, O., is erecting a new addition to its plant. The added space will be used for a plating room. The company operates a brass foundry, brass machine shop, tool room, and plating, polishing and grinding departments.

The Roller-Smith Company, 233 Broadway, New York City, announces the appointment of **Wise and Braisted,** General Motors Building, Detroit, Mich., as district sales agent in Michigan for the sale of Roller-Smith products, electrical measuring and protective apparatus.

Beach Foundry, Ltd., Ottawa, Ont., has issued $150,000 of 7 per cent cumulative, first preferred stock of $100 par value, the fund to be used for factory improvements and for financing the company's increasing business. The company operates a plant with casting, cutting-up, spinning and turning departments.

Wahl Plating and Manufacturing Company has been organized with offices and plant at 35 South Street, Rochester, N. Y., by **Adolph Wahl,** for the past fourteen years secretary and treasurer of **The Metal Arts Company, Inc.,** Rochester, and for the ten years previous to that with the Bastian

Brothers **Company.** Mr. Wahl, who is a plating specialist, states that the new concern will do plating and finishing of all kinds but will specialize in gold, silver, bronze and antique finishes, and in metal refinishing. Mr. Wahl is very well known in the plating trade, having organized the Rochester Branch of the American Electroplaters' Society.

United States Aluminum Company, Fairfield, Conn., a subsidiary of the Aluminum Company of America, is building a new plant, to be finished about the end of the year, which will be used exclusively for the production of aluminum castings. According to Mr. Becker, manager of the plant, it will be 300 by 700 ft. in area, two- and one-story.

Blackhawk Foundry and Machine Company, Davenport, Iowa, has acquired an entire block adjacent to its plant to provide for plant expansion. The company has aluminum and grey iron casting departments, owning about 5 acres of land. It is one of the largest aluminum melters in the midwest. Business thus far this year, it states, has been 33 per cent larger than in the same period last year.

The Ohio Pattern Works and Foundry Company, 2730 Spring Grove Avenue, Cinncinnati, Ohio, has let general contract for a 4-story and basement addition, 60 by 200 ft., which will cost over $150,000 without equipment. The company operates a non-ferrous foundry and refinery, wood and metal pattern shops, brass machine shop, tinning, plating, grinding, polishing and lacquering departments.

Review of the Wrought Metal Business

By J. J. WHITEHEAD,
President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

OCTOBER 1, 1928.

Advances in price of brass, copper rods, sheets, tubes and wire were rather frequent in October following the higher levels established in ingot copper quotations. During the month the price of brass products was raised ¾c. per pound and sheet copper price advanced 1c. per pound. Orders have continued to pour in on the mills in increasing volume, so that at this time the producers are practically sold out of their entire production for the balance of the year. It is reported that some large concerns have been trying to place orders for millions of pounds of copper wire for three months delivery, but have been unable to do so on account of the sold-out position of the mills. Never since the war has a similar condition prevailed, and never before in peace times has there been such a demand for brass and copper products. All of the enormous productive capacity developed for the war requirements is now in use, and even that is not sufficient. New installations of machinery are being made in some plants to keep pace with this tremendous demand. Much of this demand is due, of course, to the general business prosperity of the country, but this would not produce the present results without the background of educational work that has been done by advertising to create the demand for products made of brass and copper for all sorts of mechanical and domestic use. As this demand is constantly increasing it would appear that the industry may reasonably expect to be in a prosperous condition for a considerable time to come.

Producers of Monel metal and nickel-copper alloys are extremely busy. In October the tonnage booked in orders for Monel metal breaks the record for all time and demand for nickel is greater than the present supply. The success of the advertising campaign for Monel metal has been so great that the program for the coming year has been extended to cover a national campaign in magazines of wide circulation as well as trade papers in all lines of industry.

Metal Market Review

By R. J. HOUSTON,
D. Houston & Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Copper

NOVEMBER 1, 1928.

For many weeks the market for copper has been both strong and exceedingly active. Present prices are the highest in over five years and have advanced ¾c per pound since October 1. Domestic manufacturers and foreign consumers have been keenly alive to the situation. Orders of exceptional size were consequently placed and new purchases continued in heavy volume despite the advancing prices.

Producers have been confronted by a tremendous demand. Advancing prices have only stimulated the buying movement and all selling interests find the situation growing more tense. Refined stocks in primary hands are reduced to a low ebb, and new supplies are being shipped out on contract in large volume at a rapid rate. Shipments into consumption and for export thus far this year are far ahead of production. Consumption in 1928 will outdistance that for 1927, and the strong price situation is thoroughly justified by actual conditions. As this report closes the market is strong at 16 cents delivered to Connecticut Valley points and 16¼ cents per pound c.i.f. European ports. Recent sales were heavy both for domestic delivery and export shipment.

Zinc

Market developments in zinc reveal no pronounced change in the situation. The price of prime Western slab zinc is held fairly steady at 6.25c at East St. Louis and at 6.60c for New York delivery. Sales showed some improvement in the second half of the month, but the buying movement is not vigorous enough to give the market a decided degree of strength which would prepare consumers for a sharp advance. Static conditions and extreme conservatism go together. Stocks in smelters hands on October 1 were 47,915 tons, an increase of 3,499 tons for September. They are the largest in many months and furnish an illuminating argument for a remedy. The capacity for overproduction is all too apparent.

Tin

The tin market has definitely receded from former extremely high prices, and a half dollar, and less, per pound is looked upon as in keeping with current conditions. The market's action lately both here and abroad reflected lack of strong support at the present price level. Recent selling pressure on nearby deliveries resulted in the obliteration of the premium on spot tin, and the attitude of consumers has been too conservative to create a firmer tendency. This at least was the case for a considerable time, but tin is subject to sudden and radical changes which could readily alter the price movement overnight. At the beginning of October price of spot straits tin was quoted at 50 cents, but before the middle of the month all positions were lower with spot delivery at 48¼ cents. The trend of market showed improvement in the

last half of month, but there were considerable fluctuations and periods of extreme dullness. Total visible supplies on October 1 were 19,924 tons, an increase of 4,191 tons since January 1, 1928. Market quotations at this writing were 49c to 49½c for spot and 49c to 49¼c for November.

Aluminum

There are no new developments to materially alter the situation in aluminum. Demand is keeping up to a high level, prices are unchanged and indications are for a new high record for consumption in 1928. Requirements of automobile manufacturers, vacuum cleaners, washing machines and other industries are taking large shipments of the metal for prompt and forward deliveries. Current quotations are steady at 24.50c for 99% plus ingot and 23.90c for 98-99% plus grade.

Antimony

There was a moderate amount of activity in antimony during October. The buying, however, was spasmodic and the market lost ground owing to free offerings of different positions. The feeling was quite unsettled at times, and consumers showed caution in placing large orders even at concessions. Chinese regulus 99% quotes 10⅜c to 10½c for spot material duty paid. These figures compare with 11¼c to 11⅜c at the beginning of October. The tone was inclined to be steady lately, but demand was not specially urgent.

Lead

Consumers bought lead in good volume during the month of October reflecting a continuously large outlet for production. Values remained stationary, however, on the basis of 6.32½c St. Louis and 6.50c New York. There were rumors of a slight shading on the Middle West position, but this did not appear to be much of a factor. Makers of cables, ammunition and batteries have been liberal buyers. Actual necessities now in progress are large, and consumers were active buyers of November and December shipments. Producers are well sold out on nearby deliveries, and as conditions look at present, the market may be expected to develop decided improvement.

Quicksilver

Prices for quicksilver weakened recently and present quotations are $124.50 to $150 per flask. A fair inquiry is reported. Stocks of quicksilver are not very large, and a sudden improvement in demand might tend to stiffen prices.

Platinum

Demand continues quiet and quotation unchanged at $75 per ounce for refined platinum.

Silver

There are no important changes to note in the silver situation. A rather quiet market prevailed lately and price fluctuations were within narrow limits. China and India were buyers at intervals on quite a good scale which lifted the price to 58¾ cents. Support from the Far East, however, has not been important enough to prove a very powerful market influence. London and New York have held around the present levels for some time so that the situation is without any especial stimulant.

Old Metals

During the past few weeks there has been a notable increase in the volume of trading in practically all the copper and brass scrap metals. The repeated sharp advances in the market for new refined copper has created greater interest and activity in secondary material. Exporters have been rather hesitant in meeting the upward trend of prices, but domestic buyers have been ready buyers of all grades of copper and brass. Heavy copper scrap has sold up to 14¼ cents delivered in eastern territory. There has also been an active demand for new brass clippings. Other brass material is finding ready sale at improved prices. White metal is in fair demand, with a good movement in aluminum. Lead and zinc in fair request. Prices dealers bid for old metals are 13½c to 13¾c for crucible copper, 11½c to 11¾c for light copper, 7¾c to 8c for heavy brass, 10½c to 10¾c for new brass clippings, 5c to 5.35c for heavy lead and 16¼c to 17c for aluminum clippings.

Daily Metal Prices for the Month of October, 1928

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16	17
Copper c/lb. Duty Free													
Lake (Delivered)	15.25	15.25	15.375	15.375	15.375	15.375	15.375	15.375	15.375	*	15.375	15.375	15.375
Electrolytic (f. a. s. N. Y.)	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	....	15.25	15.25	15.25
Casting (f. o. b. N. Y.)	15.00	15.00	15.00	15.00	15.00	15.00	15.25	15.00	15.00	....	15.00	14.95	14.95
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	....	6.25	6.25	6.25
Brass Special	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	....	6.35	6.35	6.35
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	50.00	49.625	49.50	49.375	49.00	48.75	48.625	48.625	48.25	....	48.625	48.50	48.75
Pig 99%	49.625	49.25	48.875	48.75	48.50	48.375	48.25	48.25	47.75	....	48 00	48.00	48.375
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.325	6.325	6.325	6.325	6.325	6.325	6.325	6 325	6.325	....	6.325	6.325	6.325
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	....	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	....	35	35	35
Shot	36	36	36	36	36	36	36	36	36	....	36	36	36
Electrolytic	37	37	37	37	37	37	37	37	37	....	37	37	37
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	11.375	11.375	11.375	11.375	11.375	11.375	11.125	11 25	11.25	....	11.125	11.00	11.00
Silver c/oz. Troy Duty Free	57.875	57.625	57.75	58.125	58.00	58.50	58.75	58.50	58.25	....	58	58	58.125
Platinum $/oz. Troy Duty Free	75	75	75	75	75	75	75	75	75	....	75	75	75

	18	19	22	23	24	25	26	29	30	31	High	Low	Aver.
Copper c/lb. Duty Free													
Lake (Delivered)	15.375	15.375	15.625	15.625	15.625	15.875	15.875	16.125	16.125	16.125	16.125	15.25	15.545
Electrolytic (f. a. s. N. Y.)	15.25	15.25	15.50	15.50	15.50	15.75	15.75	16.00	16.00	16.125	16.125	15 25	15.438
Casting (f. o. b. N. Y.)	14.95	14.95	15.25	15.20	15.25	15.375	15.375	15.625	15.625	15.625	15.625	14.95	15.142
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Brass Special	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	49.00	49.625	49.50	48.75	48.50	48.50	48.50	49.25	49.25	49.625	50.00	48.25	49.006
Pig 99%	48.625	49.25	49.125	48.50	48.25	48.25	48.25	49.00	49.00	49.25	49.625	47.75	48.614
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.325	6.325	6.325	6.325	6.325	6.325	6.325	6 325	6.325	6.325	6.325	6.325	6.325
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	37	37	37	37	37	37	37	37	37	37	37	37	37
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	10.875	10.875	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	11.375	10.50	10.943
Silver c/oz. Troy Duty Free	58.00	58.00	57.75	57.875	58.00	58.125	58.375	57.875	58.00	58.125	58.75	57.625	58.074
Platinum $/oz. Troy Duty Free	75	75	75	75	75	75	75	75	75	75	75	75	75

*Holiday.

Metal Prices, November 5, 1928

NEW METALS

Copper: Lake, 16.125. Electrolytic, 16.25. Casting, 15.625.
Zinc: Prime Western, 6.25. Brass Special, 6.35.
Tin: Straits, 49.25. Pig, 99%, 48.875.
Lead: 6.325. **Aluminum,** 24.30. **Antimony,** 10.375.
Nickel: Ingot, 35. Shot, 36. Elec., 37. Pellets, 40.
Quicksilver: flask, 75 lbs., $125. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 58.00.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $75.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10¾to11½
Brass Ingots, Red	13 to14¼
Bronze Ingots	16 to18½
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	24 to40
Manganese Bronze Ingots	13 to17
Manganese Bronze Forging	32 to42
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	14 to16
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17 to20
Phosphor Tin, no guarantee	60 to70
Silicon Copper, 10%, according to quantity	28 to32

OLD METALS

Buying Prices		Selling Prices
13½to13¾	Heavy Cut Copper	14½to14¾
12¾to13	Copper Wire, mixed	14 to14¼
11 to11½	Light Copper	12 to12½
10½to10¾	Heavy Machine Composition	12 to12½
7¾to 8	Heavy Brass	9¼to 9½
6½to 6¾	Light Brass	8 to 8¼
7¾to 8	No. 1 Yellow Brass Turnings	9¼to 9¾
9¾to10	No. 1 Composition Turnings	10¾to11
5½to 5¾	Heavy Lead	6¾to 7
3½to 3¾	Zinc Scrap	4¾to 5¼
8 to10	Scrap Aluminum Turnings	12½to14¼
13 to13½	Scrap Aluminum, cast alloyed	17½to18½
19 to20	Scrap Aluminum sheet (new)	22 to22½
35 to37	No. 1 Pewter	41½to43½
17	Old Nickel Anodes	19
17½	Old Nickel	19½

Wrought Metals and Alloys

COPPER SHEETS

Mill shipment (hot rolled) .....24⅝c. to 25⅝c. net base
From stock .....25⅝c. to 26⅝c. net base

BARE COPPER WIRE

17¾c. to 17⅞c., net base, in carload lots.

COPPER SEAMLESS TUBING

25½c. to 26½c., net base.

SOLDERING COPPERS

300 lbs. and over in one order .....22½c. net base
100 lbs. to 200 lbs. in one order .....23c. net base

ZINC SHEET

Duty sheet, 15% Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount ..... 9.75 net base
Casks, jobbers' price .....10.25 net base
Open casks, jobbers' price .....10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 60¾c. to 62¾c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect May 25, 1928
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.20½	$0.22	$0.24
Wire	.21	.22½	.24½
Rod	.18¼	.22¾	.24¾
Brazed tubing	.28½	....	.33¾
Open seam tubing	.28½	....	.33¾
Angles and channels	.31½	....	.36¾

BRASS SEAMLESS TUBING

27c. to 27⅛c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod ..... 22½c. net base
Muntz or Yellow Metal Sheathing (14"x48") .... 20½c. net base
Muntz or Yellow Rectangular sheet other Sheathing ..... 21½c. net base
Muntz or Yellow Metal Rod ..... 18½c. net base
Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	28.25c.	10% Quality	31.25c.
15% Quality	29.75c.	15% Quality	35.00c.
18% Quality	31.00c.	18% Quality	38.25c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, November 5, 1928

ANODES

Copper: Cast	21¼c. per lb.	**Nickel:** 90-92%	45c. per lb.
Rolled, oval	21⅜c. per lb.	95-97%	47c. per lb.
Rolled, sheets, trimmed	22⅝c. per lb.	99%	49c. per lb.
Brass: Cast	22¾c. per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 62¾ to 64¾c., Troy ounce, depending upon quantity.	
Zinc: Cast	12 c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$31.00
14" 20 ply 64/68 Unbleached	39.95
12" 20 ply 80/92 Unbleached	33.05
14" 20 ply 80/92 Unbleached	44.80
12" 20 ply 84/92 Unbleached	42.50
14" 20 ply 84/92 Unbleached	57.60
12" 20 ply 80/84 Unbleached	38.35
14" 20 ply 80/84 Unbleached	52.00
Sewed Pieced Buffs, per lb., bleached	45-70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12-.17
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 and 125 lb. drums	lb.	.21-.22
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.17¾-.22¼
Denatured, drums	gal.	.45-.53
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride, solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls.	lb.	.03¾
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.28
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16-.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.06
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry, bbls.	lb.	.29
Chloride, bbls.	lb.	.18
Salts, single, 300 lb. bbls.	lb.	.10½
Salts, double, 425 lb. bbls.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.49½-.54¼
Cyanide (fluctuating)	oz.	.57-.66
Nitrate, 100 ounce lots	oz.	.42¾-.51½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.19
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.37-.38
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¾